Alberta
Government

# RESEARCH CAPACITY IMPACTS

# 2012 REPORT

Alberta Enterprise and Advanced Education

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December 2012

# Research Capacity Program

*For more information on the Research Capacity Program, please visit the EAE website at: http://eae.alberta.ca/*

Alberta Enterprise and Advanced Education (EAE) manages and funds investments in science and research that support the development of innovation in Alberta. The province's innovation capacity is strengthened by making research infrastructure investments at Campus Alberta institutions.

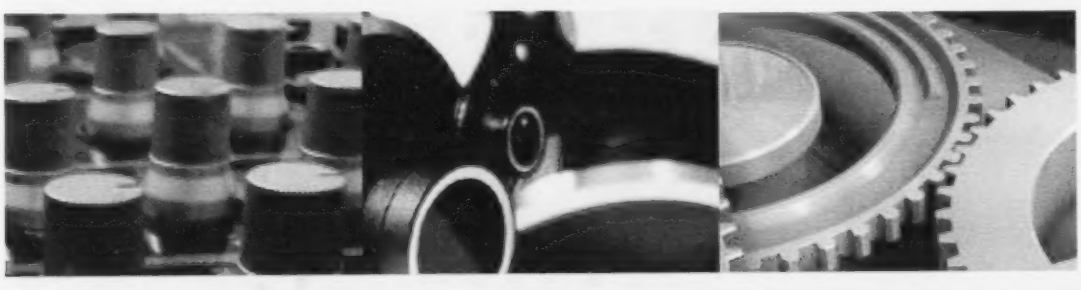
The Research Capacity Program (RCP) is the province's core mechanism for funding and building strategic research capacity. Through the RCP's investments in research equipment, Alberta's researchers acquire cutting-edge tools to conduct innovative science, which in turn accelerates the development and commercialization of ideas that impact the Alberta economy.

The provision of state-of-the-art equipment also supports the retention, recruitment, and development of the brightest innovators and entrepreneurs by providing them with the funding, expertise, recognition, and facilities they need to succeed.

The RCP aligns investments with the research priorities of the Government of Alberta (GoA), Alberta Innovates corporations, and Campus Alberta institutions. The alignment of provincial research priorities builds core capacity to enable Alberta's research and innovation system to support key outcomes for Albertans.

The RCP also leverages funds from the federal Canada Foundation for Innovation (CFI), the private sector and other sources to maximize the research dollars flowing into Alberta's research priority areas.

There are four RCP streams that parallel and leverage CFI funding streams. The Small Equipment Grants Stream (SEG) enables universities to acquire research equipment for individual researchers or small teams. The Infrastructure Sustainability Stream / Research Infrastructure Stream (IS/RI) supports large multidisciplinary research infrastructure for researchers well established in their fields. The College-Industry Innovation (CII) Stream has been recently introduced to build applied research capacity in the college and polytechnic sector. Impacts of these awards will be detailed in future RCP reports.



## THE ALBERTA RESEARCH AND INNOVATION PLAN

Coordination and consultation between GoA ministries and Alberta Innovates corporations has enabled the annual development of the Alberta Research and Innovation Plan (ARIP).

The ARIP conveys research directions, key outcomes, and themes for the research and innovation system that were collaboratively developed by GoA ministries and Alberta Innovates corporations.

The ARIP is intended to encourage alignment of research and innovation efforts in Alberta. An effective and aligned research and innovation system is critical to facilitate the pursuit of the GoA's broad directions of advancing world-leading resource stewardship, securing Alberta's economic future and investing in families and communities.

The ARIP's guidance is intended to spur stakeholder collaborations to achieve the province's key outcomes of: Effective Resource and Environmental Management; Broadened Economic Base; and Resilient, Healthy Communities.

The key outcomes in turn support the three research and innovation themes: Managing Cumulative Effects; Developing Alberta's Bioeconomy; and Enabling Individual/ Community Health and Resilience (Chart 1). To strengthen the research and innovation system and contribute to prosperity and quality of life, the ARIP has three core strategies, described in Table 1 (see page 3).

The Research Capacity Program supports the ARIP strategies with a focus on building Alberta's research strengths in the areas of energy and environment, bio-industries and health, as well as in the core areas of omics, nanotechnology, and information and communications technology (ICT).

## COORDINATING RESEARCH IN ALBERTA

The Alberta Innovates corporations are an integral part of Alberta's research and innovation system, which is designed to strengthen the province's role as a world leader in using science to seek solutions.

EAE works with the corporations, other GoA departments and Campus Alberta institutions to enhance innovation and to build research capacity in strategic priority areas.

The four corporations are:

Alberta Innovates Bio Solutions

Alberta Innovates Energy and Environment Solutions

Alberta Innovates Health Solutions

Alberta Innovates Technology Futures

Chart 1

| GoA Directions | | Key Outcomes | | Themes |
|---|---|---|---|---|
| Advancing World Leading Resource Stewardship | → | Effective Resource and Environmental Management | ↔ | Managing Cummulative Effects |
| Securing Alberta's Economic Future | → | Broadened Economic Base | ↔ | Developing Alberta's Bioeconomy |
| Investing In Families and Communities | → | Resilient, Healthy Communities | ↔ | Enabling Individual/Community Health and Resilience |

Table 1

## The Alberta Research and Innovation Plan

| Strategies | Support / Actions |
|---|---|
| | |
| **Building Research Capacity:** Maintaining a strong base of research strengths in Alberta. | People |
| | Research infrastructure |
| | |
| **Focusing on Targeted Areas:** Strategically building on the strong base of research. | Identify and invest in strategic research initiatives that add value |
| | Pre-commercialization and knowledge translation capacity |
| | |
| **Developing a Dynamic and Aligned Learning and Research and Innovation System:** GoA, Campus Alberta and Alberta Innovates as a system to advance research and innovation. | Enhance Pan-Alberta collaboration |
| | Optimize resources |
| | Create a culture of entrepreneurialism |

**Three core strategies are being pursued to strengthen the research and innovation system and to contribute to social, environmental and economic benefits for Albertans.**

## CUMULATIVE RESULTS

The RCP uses a cost-shared funding approach to provide up to 40% of the total eligible project costs[1] for successful proposals, enabling projects to leverage support from the Canada Foundation for Innovation (CFI) and other sources (Chart 1).

Since its inception in 2000, the Research Capacity Program (RCP) has invested more than $225 million and has leveraged $720 million more in other funding, bringing a total of $945 million to support research and innovation activities in Alberta. Despite the RCP's 40% funding formula, the program has leveraged 76% of all projects' total costs from other sources (Chart 2). As a catalyst for innovation, the RCP's leveraging ratio currently stands at 3.2:1.

Since its introduction, the RCP has invested in 362 research projects, which have enabled over 250 new and experienced professors to carry out their research activities in the province. By attracting and retaining highly qualified people with equipment and facilities, the RCP is creating a climate that builds synergy and collaborations among Alberta's leading researchers and is providing state-of-the-art training opportunities for graduate students - the next generation of talented innovators.

Key research activities enabled by RCP equipment support have gained national and international recognition and contributed to treatments and diagnoses for improved health outcomes, new environmentally sustainable practices, and more efficient oil, gas and oil sands extraction, to name a few.

This report focuses on selected research project highlights described on pages 5 to 18.

A listing of the RCP projects funded from 2007 to 2011 is detailed on pages 19 to 47.

Chart 2

RCP's Cost-Shared Funding

RCP funds provide up to 40% of the project costs, enabling projects to leverage support from the Canada Foundation for Innovation and other sources.

Research Capacity Funds Leveraged[2]

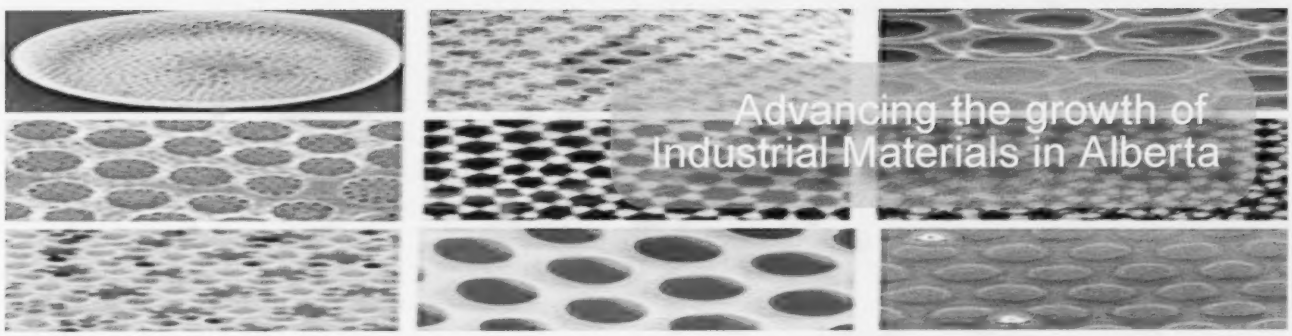
Since 2000, RCP has invested more than $225 million and has leveraged $720 million more in other funding, bringing a total of $945 million to support research and innovation activities in Alberta .

[1] *Projects may include equipment, construction, renovations, specimens, and databases. Proposals must address strategic, fundamental infrastructure needs related to maintaining or enhancing the competitiveness of the Alberta university research system and contribute to Alberta's economic competitiveness and/or quality of life.*

[2] *Some Alberta investments have helped to leverage significant national facilities, such as the Canada Light Source, and Compute Canada, thus increasing the overall leverage of the program.*

# RCP FUNDING HIGHLIGHTS

# Surface Engineering and Science




## THE ALBERTA CENTRE FOR SURFACE ENGINEERING AND SCIENCE

Surface Engineering and Science is the study of the interactions between the physical, chemical and biological surface properties of materials and the environment. Studying such interactions is incredibly important to the fields of semiconductors, electronics, chemical catalysis and nanofabrication. It also plays a major role in the development of alternative energy sources, such as solar and hydrogen fuel cells. To facilitate this research, the University of Alberta's Faculty of Engineering established the Alberta Centre for Surface Engineering and Science (ACSES). ACSES is a state-of-the-art facility dedicated to the characterization of the surfaces associated with a wide range of materials and processes. The Director of ACSES, Dr. Douglas Ivey, leads a team of four highly trained personnel who provide nearly 200 researchers a year with guidance to make best use of the facility to tackle their surface science and engineering problems.

The facility is key for research advances in many diverse fields and it now serves users from across the country who work in the fields of materials science, chemistry, physics, earth sciences, polymers, biology and medicine. The centre is one of the best of its kind in North America, and with the help of RCP funding it has acquired a full array of equipment and instrumentation for materials surface analysis that is unique in Western Canada.

Dr. Murray Gray at the Alberta Centre for Surface Engineering Science. CREDIT: Greg Southam, The Journal

### Health Care Applications

An important health care application that exploits the properties of surface particles is a fast-healing dressing used on burn victims, designed by Canada Research Chair Dr. Robert Burrell, a professor of chemical and materials engineering. Silver particles on the surface of the dressing kill bacteria and speed healing without the need for drugs. The dressing is now used in burn units around the world and is considered one of most significant advances in wound-care history.

### ICT Applications

Using ACSES facilities, Dr. Ken Cadien, Canada Research Chair in Nanofabrication, and fellow researchers, have produced numerous patents relating to chemical mechanical polishing (CMP). CMP has the ability to make atomically smooth surfaces for the manufacture of ultra-thin devices. By inserting tungsten plugs through silicon wafers and polishing them ultra-smooth, the wafers can be directly stacked, eliminating the bulk of wiring and advancing semiconductor processing technology.

Dr. Richard McCreery of the University of Alberta's Department of Chemistry and Senior Research Officer at the National Institute for Nanotechnology has been using the ACSES infrastructure for his research on the electronic and electrochemical properties of carbon materials, and molecular electronics. He states that the "CFI/RCP has provided the infrastructure to make the University of Alberta a world-class nanotechnology research centre. Rarely can an individual afford large pieces of equipment – this kind of research needs group facilities … I wouldn't have moved without the kind of capability found at the U of A. ACSES represents a good use of CFI/RCP funding: it has a broad multidisciplinary user base, and good technical skills. I could not have done what I needed to do without the ACSES equipment."

### Oil sands Applications

Dr. Murray Gray at the Centre for Oil Sands Innovation (COSI) and his research group have been looking at ways to reduce waste – called coke – produced in oil sands extraction. Using instruments at ACSES, Gray aims to understand better how coke is formed in the extraction process. If scientists can better understand how the coating of carbon-rich waste material occurs, oil sands industries could reduce the cost of upgrading oil sands bitumen and significantly reduce $CO_2$ emissions.

### Recruitment and Retention of Researchers

ACSES serves as a training environment for numerous graduate students from the research groups that use the ACSES facility. More than 760 students/researchers have used the ACSES facility since its inception. The skills acquired at ACSES represent intellectual capital, with the potential to generate wealth in the economy. ACSES has also played a key role in attracting new junior and senior faculty to the University.

For example, Drs. Robert Burrell, Jillian Buriak, Ken Cadien, Anastasia Elias, Stephane Evoy, Steve Kuznicki, John Nychka, Natalia Semagina, and Larry Unsworth were recruited to the University in part as a result of the ACSES infrastructure. Dr. Ken Cadien is a relatively new recruit and Dr. Buriak was recruited from Purdue University as a rising star (one of Canada's top 40 under 40 in 2003). Dr. Buriak asserts that her work on block copolymer nanolithography could not have been done without the "superb XPS, the unique SAM and other surface techniques at ACSES."

### Interdisciplinary Success

The success of ACSES demonstrates the key role infrastructure can play in bringing researchers together. Existing collaborations include many renowned scientists from around the world, and industry partners interested in becoming technology receptors. Researchers from seemingly unconnected disciplines are pooling their collective skills to tackle increasingly complex problems. These collaborations are facilitated by ACSES, which is a University facility, unaffiliated with specific faculty.

At the University of Alberta, 62 research groups have used ACSES, coming from five faculties (Engineering, Science, Pharmacy, Agricultural, Food and Nutritional Sciences and Medicine and Dentistry) and 16 departments.

In addition, 17 research groups from 7 other Canadian universities use ACSES (University of British Columbia, University of Calgary, University of Saskatchewan, University of Quebec at Montreal, the Institut National de la Recherche Scientifique - Énergie Matériaux Télécommunications Research Centre, University of Western Ontario, and Carleton University). The attraction of users from other institutions demonstrates the strength of the ACSES and attests to national awareness of research excellence at the University of Alberta.

Government research agencies also make extensive use of ACSES. These include the National Institute for Nanotechnology (NINT), the National Centre for Upgrading Technology (NCUT), Natural Resources Canada's CanmetENERGY, Environment Canada and the Department of Defence. Instrument time is provided for industrial research, including more than 15 local, national and international companies. Some companies (e.g., Micralyne, Syncrude, Versa Power Systems, IPSCO and Shell) also have or had collaborative research projects with ACSEs scientists. ACSES instruments have also facilitated international collaborations with two key state laboratories of the Chinese Ministry of Science and Technology, Johns Hopkins University, Ohio State University, Pohang University of Science and Technology (Korea), Chinese Academy of Sciences and the Bulgarian Academy of Sciences.

ACSES researchers have strong relations with leading researchers at the National Research Council, Alberta Innovates - Technology Futures and Natural Resources Canada. Interests span the development of technologies to improve the efficiency of fossil fuel production and consumption, improve safety for the workers, decrease the environmental impact of fossil fuels power generation, and increase the ability to monitor compliance with regulations.

As a direct result of research performed at ACSES there have been more than 150 refereed publications in reputable journals and more than 10 patents or patent applications.

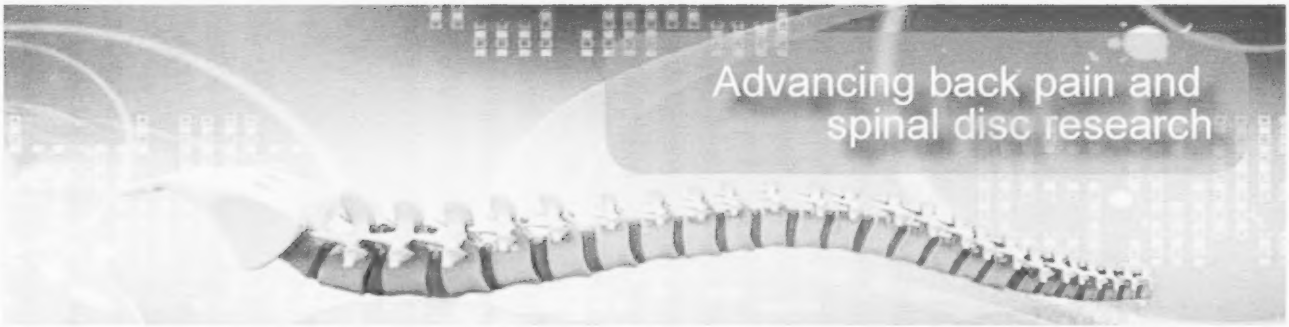
Funding of $13 million for ACSES came from the Canada Foundation for Innovation, the RCP, the University of Alberta, Syncrude, and Micralyne.

## RELATED INVESTMENTS

In addition to RCP funding for ACSES, the RCP has also provided complementary engineering research infrastructure funding to the following researchers:

- Dr. Anastasia Elias, who investigates nanotechnology, microfabrication, biomaterials and materials characterization;
- Dr. David Mitlin, who studies the design of nanostructured materials for lithium ion batteries, supercapacitors, hydrogen storage and PEM fuel cells;
- Dr. Zhenghe Xu, who assesses interfacial phenomena in mineral and material processing, advanced coal cleaning combustion and technology emission control, nanotechnology, and atomic force microscopy at interfaces;
- Dr. Tony Yeung, who studies interfacial transport; deformable surfaces on the micron scale which has application in the areas of emulsions, oil sands processing and biomembranes;
- Dr. Natalia Semagina, who investigates catalytic nanoparticles to improve bitumen processing; and
- Dr. André G. McDonald, who investigates specialized nanostructured coatings on gas pipelines and for use in various biomedical surfaces.

# Tissue and Cellular Engineering Research




Dr. Christopher Hunter, a biomedical engineer at the Schulich School of Engineering at the University of Calgary, is making a name for himself with his research into spinal disc degeneration. The RCP supported infrastructure has allowed Dr. Hunter and other researchers to build upon their proven track record in cell biology and tissue engineering and pursue innovative projects in new areas, including biomaterial development.

After graduating as an engineer at the Georgia Technical Institute, Dr. Hunter developed an interest in bioengineering, biomechanics, and biomaterials, studying cartilage and arthritis before becoming interested with the structure and function of the spine. Hunter's enthusiasm for innovative research led him to accept a position at the University of Calgary several years ago.

For people who suffer chronic back pain from degenerated or diseased spinal discs, there are few options. Although surgeons can implant a plastic or metal spinal disc to replace damaged ones, metal and plastic prosthetics can only do so much. Surgeries are also costly and recovery times are long. To put this into perspective, disc-related back pain currently affects some 50,000 Canadians, causing upwards of 30 million restricted activity days, which costs the economy approximately $5-10 billion each year. The ultimate solutions, Dr. Hunter thinks, may be found at the cellular level, where bioengineers are trying to understand how spinal discs are built in the first place.

Dr. Christopher Hunter at the University of Calgary, believes the solution to lower back pain rests at the cellular level.

This is the field of tissue engineering. While disc regenerative medicine is still in its infancy, it holds promise for growing new spinal discs that can replace the faulty discs in human patients. The primary thrust of Hunter's work is degeneration and repair of the intervertebral discs (IVDs). These discs are situated between the bony vertebral bodies of the spine, and provide flexibility and a certain degree of shock-absorption. However, when the discs degenerate due to age or disease-related processes, they can cause chronic pain and debility for the patient (such as a "slipped disc" or sciatica). Dr. Hunter's research aims to improve our understanding of how and why the discs degenerate, and to develop new biological therapies to repair, replace, or maintain degenerated discs.

A combined investment from the University of Calgary and the Canada-Alberta Western Economic Partnership Agreement established the Bose® Biomaterials and Tissue Engineering Technology Development Centre at the University of Calgary. This new centre will take research to the next level by combining specialized industry expertise and state-of-the-art infrastructure to focus on innovation and product development.

Bioengineering is by its very nature a collaborative and interdisciplinary field. The research infrastructure supported by the RCP has been essential in developing needed research capacity, adding new and/or updated analysis systems above and beyond what was already present. Moreover, the nearby Bose Biomaterials & Tissue Engineering Technology Development Centre will complement Dr. Hunter's facility to create a world-class research and development environment.

The infrastructure has been essential to the formation of several new collaborations within engineering and between engineering, medicine, and kinesiology. For example, as part of a collaborative effort with Dr. Neil Duncan (Civil Engineering), Dr. John Matyas (Cell Biology and Anatomy), and Dr. Greg Kawchuk (Rehabilitation Medicine, U of A), a device is currently being developed that will enable studying how the spine supports and resists self-weight and imposed loads, allowing for new explorations of how normal, diseased, and repaired spines behave.

Dr. Hunter has been able to leverage the facility to recruit and retain five students, post-doctoral fellows, and faculty. It remains an excellent facility, and should continue to attract high-quality trainees for some time.

## BIOMEDICAL ENGINEERING INVESTMENTS

The University of Calgary has been engaged in biomedical engineering research for over 30 years, and has developed a strong reputation as a leader in the field. Biomedical engineering by its nature is an interdisciplinary science. More than 100 researchers from the Schulich School of Engineering and the faculties of science, medicine, veterinary medicine and kinesiology are involved in inventing, developing and commercializing technologies in the health care sector that will help prevent, diagnose and treat illnesses. Among the researchers are eight Canada Research Chairs, four University Chairs, and 30 AHFMR Scholars. The RCP has helped build the biomedical engineering research infrastructure capacity at the University, through supporting many researchers including:

- Dr. Richard Frayne, who uses magnetic resonance imaging (MRI) technology to track blood flows in the brain at the tissue level;
- Dr. Elise Fear, who studies the interaction of electromagnetic fields with living systems;
- Dr. Bradley Goodyear, who focuses on functional imaging of stroke, epilepsy, multiple sclerosis, and parkinson's disease;
- Dr. Steve Boyd, who investigates microstructural bone tissue analysis in joint injuries and diseases;
- Dr. Anders Nygren, who researches electrophysiology of the heart and cellular mechanisms underlying normal and abnormal cardiac rhythm; and
- Dr. Michael S. Kallos, who studies tissue engineering, animal cell culture, bioreactor design and scale-up.

# Selected Project Highlights

## THE CONTRIBUTION OF REACTIVE GILA TO CENTRAL NEUROPATHIC PAIN

*Assistant Professor, Department of Anesthesiology and Pain Medicine*

**Dr. Bradley Kerr**

UNIVERSITY OF ALBERTA

New research infrastructure addresses the development of chronic pain after spinal cord injury or in diseases such as multiple sclerosis (MS). Dr. Kerr's multi-disciplinary investigations will provide crucial information aimed at addressing the cellular mechanisms that generate neuropathic pain in these conditions.

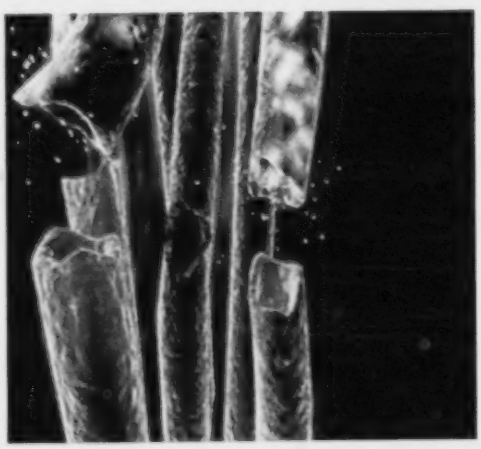
The Research Capacity Program has helped to establish a modern pain research laboratory that conducts cutting edge research projects to directly address the underlying causes of chronic, neuropathic pain. Neuropathic pain happens when nerves become damaged and then send wrong signals to the brain to experience pain in a particular part of the body. People with multiple sclerosis, diabetes, phantom limb syndrome and spinal-cord injuries, as well as those with other conditions, can experience this type of pain.

The insights gained from Dr. Kerr's studies are helping to identify new targets for drug discovery and to provide a foundation to develop new and better analgesics that will promote the health and wellness of the many Albertans suffering from these disorders.

Dr. Kerr has established a number of very productive collaborations with various members of the University of Alberta's Centre for Neuroscience. As an adjunct member of the Department of Pharmacology, he collaborates with researchers and students across the entire span of neuroscientific research, to drive forward our understanding of how the nervous system works. The Centre is home to over 90 faculty, 60 graduate students, 80 undergraduate honors students, and a host of technical and administrative support personnel.

His laboratory also interacts regularly with other laboratories within the University working on multiple sclerosis and spinal cord injury. Outside the University of Alberta, Dr. Kerr has established collaborations with researchers at McGill University, Columbia University, University of Laval and the University of Kentucky.

Dr. Kerr's laboratory is funded by operating grants from the Multiple Sclerosis Society of Canada, the National Sciences and Engineering Research Council (NSERC), and Pfizer Canada.



## TOOLS FOR APPLIED ELECTROMAGNETICS RESEARCH

Associate Professor of Electrical Engineering at the Schulich School of Engineering

**Dr. Elise Fear**

UNIVERSITY OF CALGARY

The new infrastructure supports research in the area of computational electromagnetics, and their application to problems in the realms of electrical engineering, optical engineering, and bioelectromagnetics. Dr. Fear is investigating the interaction of electromagnetic fields and living biological systems, specifically, a new approach for breast cancer detection called tissue sensing adaptive radar (TSAR).

The Research Capacity Program helped to equip Dr. Elise Fear's Applied Electromagnetic Laboratory, which facilitates biomedical engineering applications at the University of Calgary. Her research ranges from exploring new methods for optical data storage to developing new sensing technologies for many applications, from breast tumour imaging to land mine detection.

For example, Dr. Fear and her team are trying to find a better, safer and more comfortable alternative using low-power radar as a diagnostic tool for early breast cancer detection. The new technology, tissue sensing adaptive radar (TSAR), involves illuminating the breast with a pulse of radio frequency (RF) energy and focusing reflections to create an image, which differentiates healthy and diseased tissues. TSAR is very low power, so there is no risk of heating the breast tissue, and it is designed to be a patient-friendly technology, as it does not involve breast compression.

TSAR technology has the potential to provide a new diagnostic tool for the identification of early-stage breast cancer. Dr. Fear's research is improving TSAR technology to solve several practical problems in order to produce a prototype system ready for clinical testing.

Dr. Fear's work is part of the University of Calgary's commitment to expanding its internationally-recognized research in the rapidly growing field of biomedical engineering. Fear's Applied Electromagnetic Group (AEG), consisting of four faculty members, has a number of collaborative projects within the AEG, as well as between researchers in her department and other faculties at the University of Calgary. She is also collaborating with Innovate Calgary on the microwave breast imaging project, investigating TSAR's potential for commercial applications.

Overall, the infrastructure supports a dynamic environment for research training and collaboration. At any given time over the past several years the AEG consists of 12-20 graduate students, and several post-doctoral fellows. Many of these, once they completed their studies, chose to stay in Alberta and work in the province's expanding high-tech sector.

Dr. Fear is a winner of the University of Calgary's Young Innovator award to recognize outstanding young faculty.

The TSAR prototype system used in the first patient study

## SUPRAMOLECULAR INTERFACES RESEARCH FACILITY

*Assistant Professor, Department of Biology*

**Dr. Theresa Burg**

UNIVERSITY OF LETHBRIDGE

Dr. Burg uses the new research infrastructure to examine genetic changes in Alberta's bird populations, and using this information to discover how bird populations respond to changes in their environment. Government and industry can use the information to develop policies to support sustainable development and to protect wildlife in Alberta.

The RCP research infrastructure was used to establish a core facility for Dr. Theresa Burg's molecular ecology lab at the University of Lethbridge. Dr. Burg is a leader in avian population genetics and an internationally recognized expert in seabird genetics. Her past research resulted in the development of molecular markers, revisions to the taxonomy of several bird species and detection of hybrid species. The molecular markers she developed are now being used around the world. Dr. Burg's research program at the University of Lethbridge represents one of the few labs in Canada dedicated to molecular ecology and evolution of birds to increase our understanding of natural populations, and protect and manage our natural resources.

Birds are important components of ecosystems. Species such as the pileated woodpecker are keystone species, providing nesting cavities for secondary cavity nesters including the mountain chickadee; and others are indicator species (e.g., American three-toed woodpecker) signifying habitat quality and forest biodiversity. Data collected has allowed Dr. Burg's researchers to test the various models of colonization, assist with predictions of extinctions and responses to habitat fragmentation and range shifts that result from human disturbance and climate change.

Evolution of North American forest birds is linked to historical and contemporary environmental changes and the ability of each species to adapt to climatic oscillations through a combination of gene flow, genetic drift and natural selection. As such, it is important to obtain an accurate picture of genetic variation and long-term dispersal using molecular markers. By having a better understanding of how species have responded to major historical geological events (i.e., post-glacial dispersal), Dr. Burg's team can predict how they will respond in the future, allowing researchers to make decisions that might save them and other species from extinction.

The Supramolecular Interfaces Research Facility serves as a training environment for numerous University of Lethbridge graduate and undergraduate students. For example, six researchers have been recruited and eight retained in part because of the availability of the infrastructure. In addition, five graduate students and 25 undergraduate students received training in a variety of molecular techniques (PCR, genotyping, DNA sequencing, cloning, etc.) and have the opportunity to conduct field work.

Dr. Burg's new infrastructure created the opportunity for collaborations with researchers in France, Britain, the US and other Canadian Universities. The infrastructure has also enhanced interdisciplinary research and research between different sectors (e.g., government and academia). One example of this is a project with the Canadian Wildlife Service to study microgeographic population structure in avian populations in western Canada.

## PROJECT TO RESTORE MOVEMENT

Professor, Department of Physiology

**Dr. Richard Stein**
UNIVERSITY OF ALBERTA

The new infrastructure supports research in the area of brain stimulation. The equipment has placed Dr. Stein and researchers at the University of Alberta at the very forefront of non-invasive study of brain function. The overall goal of the research is to understand the normal control of movements and to use this knowledge to restore movements to people with motor disabilities resulting from strokes, accidents and other causes.

Research in Dr. Stein's lab is focused on pattern generation of walking, the mechanical consequences of this reflex activity, and replacement of function after spinal cord injury. He also investigates the optimization of muscle and bone after atrophy.

A major development that has resulted from acquiring the RCP infrastructure is the establishment of an interdisciplinary team in "Neural Prostheses to Restore Motor and Sensory Function." The team includes researchers at the University of Alberta, the University of Calgary, University of Waterloo, University of Chicago, and Johns Hopkins University. Stein's research team has secured a $5 million grant funded by Alberta Innovates – Health Solutions, as well as funding for a Research Chair in Spinal Cord Injury Research.

Dr. Stein's work has led to the creation of multiple spin-off companies and commercialized devices including the WalkAide system which helps thousands of people who suffer from foot drop.

The innovative research accomplished with the RCP infrastructure includes:

1) Brain stimulation equipment is being used to improve the understanding of the human motor cortex and its connections with the spinal cord and other brain structures. In fact, the monitoring of descending pathways to the spinal cord has proven to be an effective way of preventing blockage of these pathways during long operations.

2) Motion analysis equipment has greatly enhanced approaches to human and animal experiments. The infrastructure has helped researchers' understanding of the development of walking and balance control in infants, as well as documenting the improvements in walking through training and innovative new systems that combine electrical stimulation and braces for people with spinal cord injury and other central nervous system disorders. There is now considerable neurosurgical interest in applying these systems to humans with spinal cord injuries and, planning for human trials has begun.

3) Electrical recording and associated equipment is being used for many projects. For example, a technique called intraspinal microstimulation (ISMS) is being developed in which sensory recordings are made and processed online to provide feedback control. This currently requires several racks of equipment, but collaborating engineers at Johns Hopkins University are miniaturizing this process to fit on an implantable microchip. The initial experiments with this chip are now underway.

Dr. Stein was recently awarded the Barbara Turnbull Award for Spinal Cord Research, one of the top awards for spinal cord research in Canada.

WalkAide system

## RESEARCH TOOLS FOR CARDIAC ELECTROPHYSIOLOGY

*Associate Professor, Department of Electrical and Computer Engineering*

**Dr. Anders Nygren**

UNIVERSITY OF CALGARY

New research infrastructure allows Dr. Nygren's lab to carry out studies of cardiac electrophysiology both at the level of whole hearts/tissue and at the level of single cells. Projects are underway to understand the mechanisms of cardiac rhythm disturbances ("arrhythmias").

RCP funds supported the establishment of a laboratory for Cardiac Electrophysiology. The main infrastructure components are: 1) a video imaging system for imaging electrical activation of cardiac tissue; 2) a microscope to be used with the camera system for imaging small preparations; and 3) a "patch-clamp" system for electrophysiological measurements on isolated cardiac cells.

The new infrastructure has had a major impact on enhancing the capacity for innovation by filling in some critical research gaps. With the RCP funded equipment, Dr. Nygren and his research team now have the capability to carry out combined experimental and computational studies of cardiovascular electrophysiology at three levels of scale: whole-organ, tissue, and cellular. These capabilities are being used in combination with computational modeling techniques already established in Dr. Nygren's lab. Projects are addressing how the properties of single cells, the electrical interconnections among cells, and the structure of heart tissue affect the likelihood of cardiac rhythm disturbances known as arrhythmias.

Having these capabilities in-house has allowed coordination of experimental and computational efforts, and has significantly reduced the turn-around time for model validation as well as model predictions to guide future experimental research.

The availability of this infrastructure has allowed Dr. Nygren to establish a laboratory within the Libin Cardiovascular Institute facilities in the Faculty of Medicine. Enabling engineering graduate students to work within a medical research facility is highly unusual, and is fostering a multi-disciplinary approach which is expected to lead to significant opportunities for collaborative and multidisciplinary work.

The shared usage of the equipment has been of critical importance to recent collaborations with two colleagues in the Faculty of Medicine. Additional collaborative work is currently being discussed.

The availability of the infrastructure has also significantly helped the recruitment of two graduate students (one MSc, one PhD) to Dr. Nygren's lab. The infrastructure supports a highly multidisciplinary training environment for Biomedical Engineering graduate students, who are given the opportunity to train alongside scientists in a medical research environment. As a result, graduates have strong multidisciplinary research skills that are highly sought after in industry and academia.

## THE ROLE OF THE TUMOR SUPPRESSOR PROTEIN, RASSF1A, IN CANCER AND INFLAMMATION

**Dr. Shairaz Baksh**

UNIVERSITY OF ALBERTA

The new research infrastructure will help Dr. Baksh to investigate the molecular mechanisms of inflammation. Dr. Baksh's research could lead to earlier cancer detection and a better understanding of possible genetic links to Crohn's disease.

*Assistant Professor, Department of Pediatrics*

Dr. Shairaz Baksh and his colleagues have actively been using the RCP funded infrastructure in order to understand the role of the tumour suppressor protein RASSF1A in the body, and its role in cancer and inflammation.

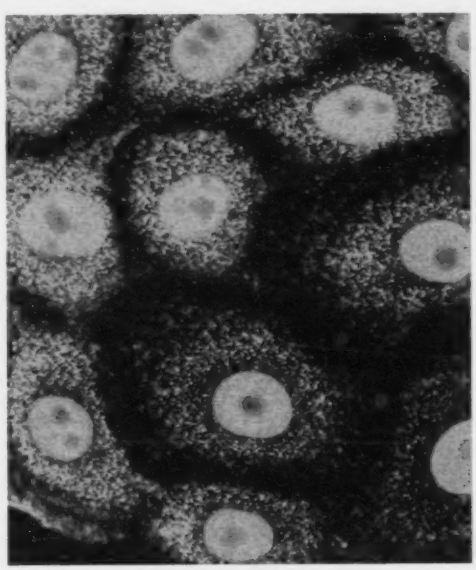
The infrastructure has greatly aided researchers' understanding of the link between how persistent inflammation can predispose individuals to progress to cancer later in life. Dr. Baksh's research team hopes to develop methods to detect and inhibit persistent inflammation, diagnose cancer at an early stage, and design targeted nano-particle drug delivery to treat both persistent inflammation and hard-to-treat cancers such as pancreatic, brain, and ovarian cancers.

The potential impacts of the research are: 1) the development of an early diagnostic test for cancer, such as lung and pancreatic cancer; 2) the development of an early diagnostic test for inflammatory bowel disease; 3) an understanding of how chronic or persistent inflammation can predispose individuals to cancer later in life; and 4) a further understanding of the variation in response to radiation therapy in the gene RASSF1A, which has a role in repairing damaged DNA.

These are just some of the benefits that will arise from Dr. Baksh's research aimed at promoting the quality of life for patients with inflammatory bowel disease and those with cancer.

The impact of the infrastructure on highly qualified personnel has been notable, as Dr. Baksh has been able to recruit five graduate students, one post-doctoral fellow and one technician in addition to seven undergraduate students since the RCP funded infrastructure was implemented.

Dr. Baksh's infrastructure is diverse, incorporating both tissue-culture based and animal-based research approaches. The RCP funded infrastructure has inspired research collaborations with several investigators at the University of Alberta in the departments of Pediatrics, Biochemistry, Cell Biology, Medicine, Oncology and the Center for Excellence in Gastrointestinal Inflammation and Immunity Research (CEGIIR). In addition, his research team has established collaborations with research groups in Singapore, England, the United States and Korea.



photomicrograph showing RASSF1A protein

## 3-D SYSTEM FOR SURGICAL TREATMENT OF LUNG CANCER

**Dr. Yaoping Hu**
UNIVERSITY OF CALGARY
*Associate Professor, Department of Electrical and Computer Engineering*

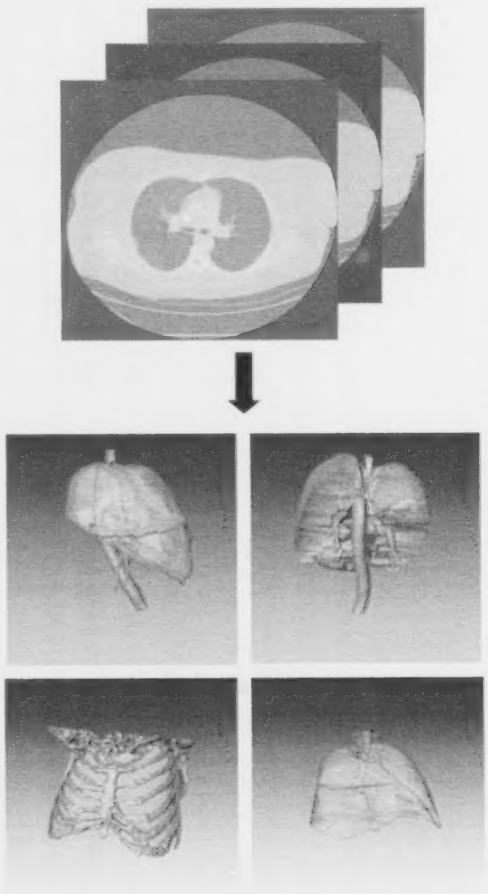
New research infrastructure enables a focus on the research and development of planSys - a three-dimensional (3-D) surgical planning system for treating lung cancer - by using the advanced technologies of virtual reality (VR).

Lung cancer causes more deaths in Canada than prostate, breast and colorectal cancers combined. Surgical removal of diseased lung tissues is often the treatment of choice. Detailed anatomic information, acquired via surgical planning by reading two-dimensional (2D) computed tomographic (CT) images, is crucial to determine whether the cancer is removable while preserving the remaining lung tissue. Currently, modern multi-slice CT scanners often tax the ability to handle all of the information presented to surgeons. For example, imagine the workload of reading about 800 2D CT images of a lung cavity and mapping anatomic structures from these images onto the actual lung cavity in three dimensions.

Based on modern and advanced virtual reality (VR) technologies, Dr. Hu's research objective is to create VR-planSys (Virtual Reality Planning System) – the world's first three-dimensional (3D) VR surgical planning system for treating lung cancer. Dr. Hu's vision is that such a system will dramatically improve the use of detailed and valuable CT information for enhanced surgical treatment efficacy and efficiency, which will result in improved patient care.

The infrastructure has enhanced research training of highly qualified personnel and promoted collaborative, interdisciplinary research and development. Since the installation of the infrastructure, one post-doctoral fellow, two PhD students, eight MSc students, six undergraduate students and two technicians have been recruited and trained in Dr. Hu's laboratory.

Research collaboration have been established with surgeons/radiologists, researchers, and engineers from various disciplines at the University of Calgary, and with Alberta-based industries such as TRLabs and Innovate Calgary, and an international collaboration from the University of Poitiers, France.



VR-planSys: 3D VR surgical planning system for treating lung cancer

## THERMAL-SPRAYED NANOSTRUCTURED COATINGS FOR EQUIPMENT IN THE NATURAL RESOURCE SECTOR

*Assistant Professor, Department of Mechanical Engineering*

**Dr. André G. McDonald**

UNIVERSITY OF ALBERTA

Using the new research infrastructure, Dr. McDonald will investigate specialized nanostructured titania coatings on gas pipelines and other mechanical equipment in order to prevent rust damage. His aim is to bring the technology to commercialization, helping Alberta's oil and gas industry combat corrosion cracking and oil sand slurry wear.

Dr. André McDonald's RCP infrastructure grant has contributed to acquiring state-of-the-art infrastructure for the University of Alberta's Advanced Surface Technologies and Coatings Laboratory. The goal of the laboratory is to find new ways to improve hard surfaces to overcome technical issues - whether in the oil and gas sector, or in biomedical devices. The lab utilizes thermal spraying - an advanced method of fabricating protective coatings for machine parts - to fabricate the hard-faced coatings.

Dr. McDonald's research team develops solutions for surface degradation processes such as hard-particle erosion, wear, corrosion, and the impact of high temperatures. His solutions may include ceramics, metals, alloys, polymers, and composites (polymer-based or metal matrix).

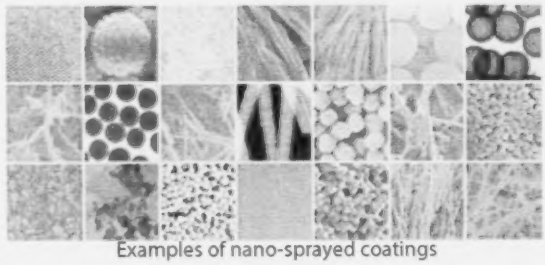
Dr. McDonald also investigates nanostructured titania-based composites for use in various biomedical surfaces. A large concern surrounding stainless steel surfaces is the ability of bacteria to grow and attach to them quite easily. One possible solution being considered by Dr. McDonald is to destroy these pathogens by coating the surfaces with a biocidal agent.

The RCP funded infrastructure has already resulted in the development of wear resistant nanostructured coatings for small downhole drilling valves used in the oil and gas sector, metal coatings on composite aircraft structure for de-icing, and anti-bacterial nanostructured coatings.

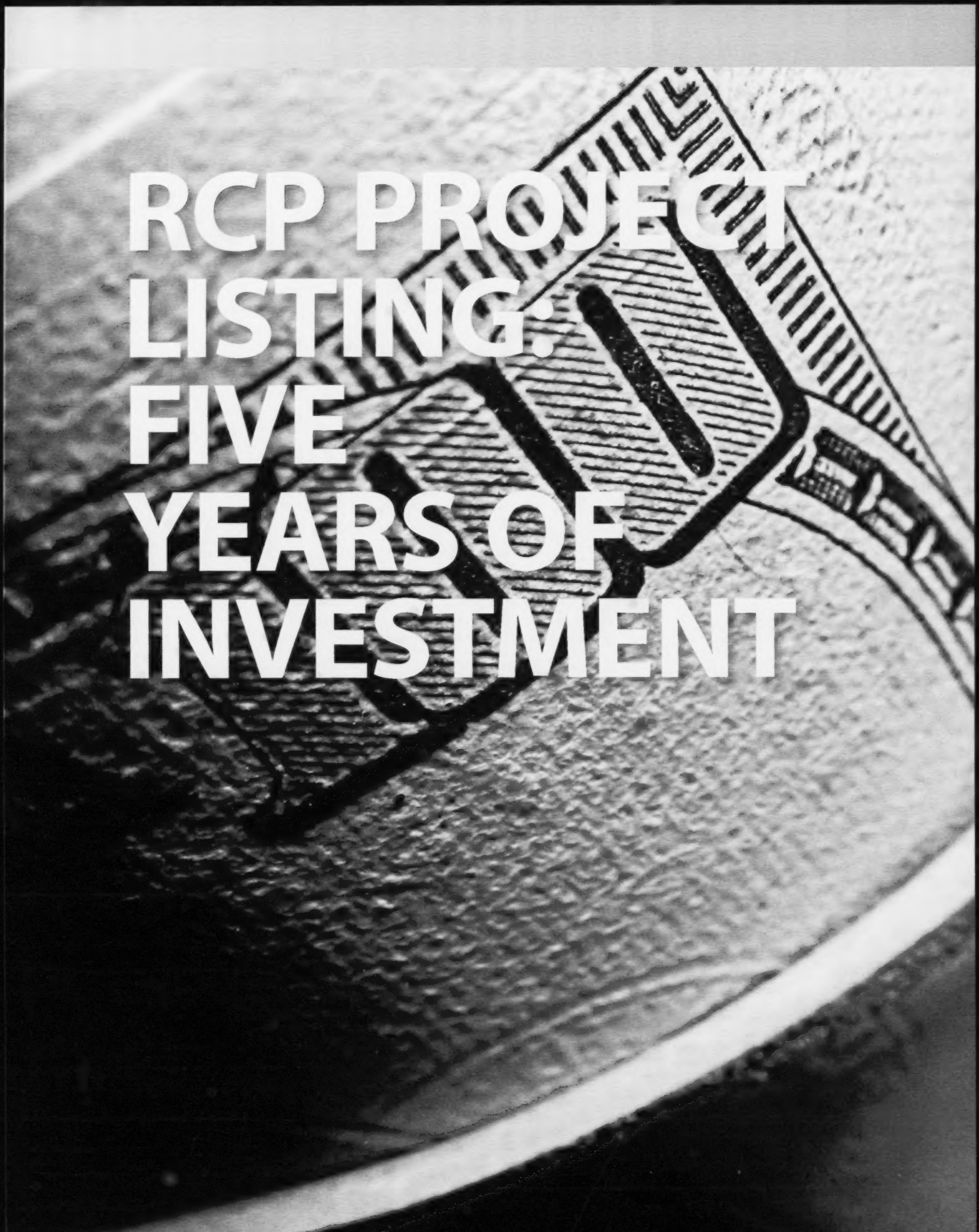
Acquiring the new infrastructure for the Advanced Surface Technologies and Coatings Laboratory has been extremely important to the training of highly qualified people in a broader area of applied physics and chemistry. Thirty-two graduate and undergraduate students have had the opportunity to benefit from this technology.

Technologies in Dr. McDonald's lab are also widely used by other fields, allowing students the opportunity to collaborate with colleagues studying other disciplines, increasing the flow of knowledge among students. As a result, these technologies have played a research role in such diverse fields as medical microbiology, oil and gas industries and aerospace.

Dr. McDonald has also been able to establish collaborations with the Industrial Materials Institute at the National Research Council, Alberta Innovates – Technology Futures, Alberta Health Services, SST Centerline, Ltd., FPInnovations, and Ulterra, L.P.



Examples of nano-sprayed coatings



# RCP PROJECT LISTING: FIVE YEARS OF INVESTMENT

## ALBERTA RESEARCH CAPACITY PROGRAM PROJECT LIST 2007-2011

## RESEARCH INFRASTRUCTURE STREAM AND INFRASTRUCTURE SUSTAINABILITY STREAM

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2008/09 | Geomechanical/Reservoir Experimental Facility (GeoREF) | The GeoREF will provide the tools to gain critical knowledge of the behavior of oil sands, shale, and carbonates during thermal recovery processes. Research outcomes from the GeoREF will underpin the technology for carbon storage projects and support the sustainable, safe development of Alberta's unconventional hydrocarbon resources, including coal gasification. | Rick Chalaturnyk | University of Alberta | $4,078,511 | $1,630,061 |
| 2008/09 | Ultraclean Isotope Analysis Facility for Innovative Geochronology | Dr. Creaser and his research team are world leaders in isotope geochemistry. The infrastructure provides the needed tools for innovative geochronology research in areas relating to energy and natural resources. The Isotope Analysis Facility will enable researchers to provide the scientific underpinning which guides industry in their efforts to explore and make use of mineral and petroleum resources. | Robert Creaser | University of Alberta | $1,292,627 | $517,051 |
| 2008/09 | The Resolute Bay Incoherent Scatter Radar: A Space Science Initiative in Nunavut | The award will build a world-leading facility for direct ionospheric observations in Canada's North which will operate synergistically with a facility in the U.S. Arctic. RISR will enable researchers to study the significant effects of space weather on satellite and aircraft communication and navigation systems and its longer term effects on the environment and climate change. The RISR provides the Calgary region with commercialization opportunities in global navigation satellite systems, GPS accuracy, and new technologies to rapidly access remote data. | Eric Donovan | University of Calgary | $24,343,381 | $7,128,810 |
| 2008/09 | Rapid and Secured Communication Network for Exchange of Medical Images in the Canadian Atherosclerosis Imaging Network (CAIN) - CFI National Award | CAIN is one of the leading national collaborative networks in Canada. The research infrastructure will create a rapid and secure communication network, state-of-the-art image management and analysis software, and innovative imaging technologies. This technology will enable the sharing of clinical and research data across the country to improve the diagnosis and treatment of heart disease. | Richard Frayne | University of Calgary | $3,043,418 | $1,217,367 |
| 2008/09 | Canadian Longitudinal Study on Aging | The equipment purchased will enable the development of a tremendous source of long-term information which will be used to answer basic research, clinical, and population health questions. The award provides the equipment to collect health measurements from patient participants and the computational resources to share the data securely across this national network of researchers. The high quality of the data will allow researchers to address complex population health and policy questions related to an aging population which were otherwise not feasible. | David Hogan | University of Calgary | $957,552 | $383,021 |
| 2008/09 | Subzero Facility for Processing and Analysis of Hydrocarbons in Pristine Planetary Samples | A unique facility will be built in Alberta so that researchers may store, process, and handle pristine astromaterials, including meteorites. The facility will protect the valuable samples from any further earth-based contamination that they could receive. This new facility will also support the work of Dr. John Shaw, NSERC Industrial Chair in Petroleum Thermodynamics at the University of Alberta. | Christopher Herd | University of Alberta | $434,005 | $173,602 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2008/09 | emSYSCAN: Embedded Systems Canada | emSYSCAN is a national embedded computerized systems initiative. The infrastructure will allow researchers to meet the challenge of the global shift from discrete chip-based electronics products to those that implement complete systems on a single computer chip. The network enables prototype development and provides access to a library of system components and computer-aided design tools through secure internet communication links. The research is closely linked to industry to enable rapid commercial deployment of new applications in the fields of information and computer technology, medicine, and biotechnology. | Karan Kaler | University of Calgary | $3,813,875 | $1,525,551 |
| 2008/09 | Cell and Tissue Innovative Research Centre (CTIRC) | The funding will support the development of a specialized centre capable of producing clinical grade cells and tissues to treat a wide variety of chronic and acute diseases and injuries. The Centre will focus on developing insulin-producing cells for the treatment of diabetes, skin treatment for burn victims, and developing new treatments for people with lung disease. This type of facility will enhance and accelerate the possibility of developing commercial and clinical applications in Alberta. | Gregory S Korbutt | University of Alberta | $26,509,863 | $10,603,945 |
| 2008/09 | ACWA: Advancing Canadian Wastewater Assets | The ACWA Research Facility will integrate engineering, chemical, and biological expertise with a full-scale research approach to address wastewater treatment and environmental water issues in Alberta. The ACWA initiative is an innovative collaboration with the City of Calgary's Pine Creek Wastewater Treatment Plant, through which scientists will investigate and demonstrate new technologies to treat contaminants and minimize their impacts on aquatic ecosystems and public health. | Lee Jackson | University of Calgary | $29,506,447 | $10,373,152 |
| 2008/09 | ENVIRO-NET: Sensing our Changing Environment | The ENVIRO-NET infrastructure will provide unique research opportunities in sensor design, networking and communication, data mining, storage, retrieval, management, and analysis. The infrastructure will use integration of carbon flux measurement instruments and advanced GPS applications aimed at monitoring the response of boreal forests to industrial development and other climate change indicators. The infrastructure will position the University of Alberta as one of the key players worldwide in the design and implementation of wireless sensor networks for environmental monitoring and assessment. | Arturo Sanchez-Azofeifa | University of Alberta | $1,816,200 | $726,480 |
| 2008/09 | Southern Alberta Group for Epigenetic Studies (SAGES) - Epigenetic Regulation of Cell Memory and Stress Responses | Epigenetics is the study of changes in appearance or gene expression that are not related to changes in the DNA sequence. This award will bring together researchers in the institution's areas of strength (neuroscience and molecular biology) to lead in this emerging area of research. SAGES will enable scientists to make major new discoveries related to improved understanding and treatment of human disease (e.g., cancer, Parkinson's Alzheimer's), new biofuel models, and environmental toxicology, to name a few. | Robert Sutherland | University of Lethbridge | $8,108,014 | $2,816,548 |
| 2008/09 | Instrumentation for Molecular Breeding for Specialty Oils | The award will support the development of specialty oilseed crops, such as canola and flax for the production of enhanced oils for human health and nutrition. The integration of plant biotechnology and nutritonal science will optimize the impact of the research. The project will strike a balance between scientific push and industrial pull to add value to Alberta's traditional crops. | Randall Weselake | University of Alberta | $5,830,110 | $2,329,057 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2008/09 | Regeneration Unit in Neurobiology (RUN) | The focus of this award is to provide the neurobiology research team with the tools required to apply innovative approaches to study the possibility of regeneration after major nerve and spinal cord injuries. The facilities will be amongst the best in the world and, in the hands of this strong team, will accelerate the development of new treatments for people with nerve and spinal cord injuries. | Douglas Zochodne | University of Calgary | $3,240,933 | $1,296,372 |
| 2008/09 | Enhancing the Science: Polarized Photons and Improved Endstations for the SGM and PGM at the Canadian Light Source | The Canadian Light Source (CLS) award brings an already productive photon tool to the leading edge of light source imaging. The tool will enable researchers to view various materials, nanostructures, catalysts, and biological tissues. Research conducted at the facility is interdisciplinary and will impact many sectors, including agriculture, health, ICT, materials, mining, oil and gas, and pharmaceutical sciences. | Jonathan Veinot | University of Alberta | $4,047,255 | $150,943 |
| 2008/09 | The Canadian Writing Research Collaboratory | The infrastructure will create a virtual online "lab" that will transform the study of Canadian writing by facilitating data sharing and analysis, networking, and collaboration for scholars worldwide, and establish a major open-access resource on Canadian writers and writing. It will enhance Alberta's information and communication technology infrastructure by providing a model for geographically distributed teams to work effectively to create high-quality knowledge resources for research, policy development, and industry collaboration. | Susan Brown | University of Alberta | $2,640,786 | $1,049,608 |
| 2008/09 | Athabasca University Geophysical Observatory Upgrades of Research Infrastructure (AUGOURI) | The infrastructure will enhance the Athabasca University Geophysical Observatory and in turn strengthen and expand the AUGOURI's international collaborations with the world's leading space scientists. The research observatory will study the radiation belts that surround the planet, the northern lights, and their relation to an unknown mechanism called "substorms" which are able to interrupt electrical power grids on the earth. | Martin Connors | Athabasca University | $1,852,864 | $712,261 |
| 2008/09 | Alberta Particle Astrophysics Experiments at SNOLAB: SNO+ and DEAP/ CLEAN | The SNOLAB project will keep Canada and Alberta at the international forefront of neutrino and dark matter physics. SNOLAB is a national research project, with strong international ties, to measure properties of particles that are critical to the formation and evolution of the universe. While the research is fundamental, there is long-term potential for contributions to understanding basic energy generation in the sun which impacts our climate systems and models. | Aksel Hallin | University of Alberta | $3,774,593 | $1,509,837 |
| 2008/09 | New Control System for MTS Hydraulic Testing Machine - Part of CFI LEF Application: Centre for Industrial Application of Microcellular Plastics | The Centre will develop innovative products and processing technologies for microcellular plastics, a new generation of materials that exhibit superior mechanical performance and significantly improve their sound and thermal insulation properties. Researchers at the University of Alberta will provide fatigue resistance testing and evaluation of the new microcellular plastics. | P-Y Ben Jar | University of Alberta | $108,584 | $43,433 |
| | | 18 Projects Total | | TOTAL: | $125,399,018 | $44,187,099 |

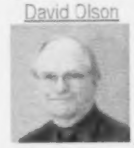
## SMALL EQUIPMENT GRANTS AND COLLEGE-INDUSTRY INNOVATION STREAMS PROJECT LIST 2007-2011

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2011/12 | Preparative Biochemistry Suite for the Study of the Ribosome as a Biomolecular Nanomachine | A detailed understanding of the dynamic properties and mechanisms inherent to the processes taking place in ribonucleoprotein assemblies will strongly contribute to unraveling the underlying design principles of biomolecular nanomachines and will further the development of biomolecular engineering. This infrastructure will allow Dr. Wieden to study the mechanistic details and the functional and structural principles underlying protein synthesis. | Hans-Joachim Wieden | University of Lethbridge | $374,424 | $149,766 |
| 2011/12 | Tools for Studying Neural Systems with Optogenetic and Electrophysiological Techniques | Optogenetics is an innovative technology for controlling the activity of specific neurons with light. In association with the Canadian Centre for Behavioural Neuroscience, Dr. Gruber will use optogenetic techniques to conduct experiments in behavioural neuroscience by combining optogenetics with state-of-the-art methods for monitoring neural activity to observe and manipulate brain function. | Aaron Gruber | University of Lethbridge | $368,598 | $147,439 |
| 2011/12 | Quantum Nanophotonics Laboratory (QNL) | The Quantum Nanophotonics Laboratory will house the world's most advanced system for probing nanoscale optical devices at low temperature, in order to study nanostructures embedded with a quantum optical system. Dr. Barclay's collaboration with the National Institute for Nanotechnology has the potential to increase the efficiency and capacity of sensing and computing technology, such as increased internet bandwidth and improved environmental scanning. | Paul Barclay | University of Calgary | $725,143 | $290,057 |
| 2011/12 | Instrumentation for Prospective Identification, Single-Cell Sorting and High-Resolution Imaging of Multipotent Dermal Stem Cells | The hair follicle, with its unique regenerative capacity and highly accessible location, is an ideal model system to study the mechanisms regulating adult stem cell behavior, tissue regeneration, and the potential therapeutic use for skin. By studying hair follicle stem cells Dr. Biernaskie aims to develop stem cell-based strategies to improve wound healing and tissue regeneration. | Jeffrey Biernaskie | University of Calgary | $736,621 | $275,074 |
| 2011/12 | Fluid-Flow Characterization of Unconventional Reservoirs | This infrastructure will enable Dr. Clarkson to describe and classify unconventional geological structures holding oil and gas resources and the flow of those resources when they are freed, as well as to develop techniques to extend lab developments into field testing. The new knowledge will help explore the potential to use the injection of carbon dioxide in unconventional reservoirs, enhance hydrocarbon recovery and reduce greenhouse gas emissions, thereby contributing to assessments for economic potential and resource evaluation for carbon capture and storage. | Christopher Clarkson | University of Calgary | $316,055 | $126,422 |
| 2011/12 | Two-Photon Imaging of Cerebral Blood Flow: From Cells and Vessels to Behaving Animals | Dr. Gordon's research focuses on understanding the cellular mechanisms responsible for cerebral blood flow, providing insights with the potential to advance our treatment of related conditions such as stroke, vascular dementia, cognitive decline, Alzheimer's and migraine. Complementary to the Hotchkiss Brain Institute's Cerebral Circulation research area, this equipment will enhance the capacity to increase the transfer of laboratory results to clinical practice and drug development. | Grant Gordon | University of Calgary | $752,427 | $300,970 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2011/12 | Infrastructure Resources to Allow the Application of Zebrafish Genetics to Understand Neural and Vascular Development | Drs. Kurrasch and Childs will explore zebrafish genetics to identify genes and gene networks involved in human neural and vascular diseases such as precocious puberty, obesity and genetic stroke and aneurysm disorders. Potential long-term outcomes include the discovery of potential biomarkers to identify at-risk children for endocrine diseases and the commercialization of related diagnostic tests. | Deborah Kurrasch Sarah Childs | University of Calgary | $704,297 | $245,720 |
| 2011/12 | Experimental Facilities for the New Unsteady Fluid Mechanics Laboratory | Unique to Canada, the Unsteady Fluid Mechanics Laboratory will focus on accelerating the deployment of new renewable-energy technologies in Alberta. Among other future clean-energy technologies, the facility will produce state-of-the-art, laser-based measurement techniques which will improve the understanding of current wind- and water-turbine flow fields and lead to more efficient and cost-effective designs. | David Rival Robert Martinuzzi David Wood | University of Calgary | $299,679 | $119,871 |
| 2011/12 | Generation of an Environmental Genomics System to Study the Evolutionary Consequences of Environmental Change in Canadian Freshwater Fishes | Dr. Rogers' research is at the forefront of environmental genomics, an emerging field that seeks to predict how organisms will respond, at the genetic level, to changes in the external environment. The long-term objective is to understand how ecology and evolution influence genetic variation in natural populations of freshwater fish, enabling organisms to respond to environmental change. | Sean Rogers | University of Calgary | $574,726 | $229,853 |
| 2011/12 | Microscopy Tools for the Study of Uterine Smooth Muscle Function in Human Pre-Term Labour | Pre-term labour occurs in 10% of all births and is the leading cause of neonatal mortality and morbidity in Canada, with the highest incidence of occurrence in Alberta. Through collaborations with clinician scientists in obstetrics and gynecology, the primary focus of Dr. Slater's research is to understand the basic underlying mechanisms controlling the onset of human labour and to improve the prediction and treatment of premature labour. | Donna Slater | University of Calgary | $274,985 | $109,994 |
| 2011/12 | Viscoelastic Materials Characterization for Novel Highly Conductive Polymer Blends/ Nanocomposites and Heavy Oils | The infrastructure will develop novel materials for oil recovery technologies and provide a greater understanding of the flow of heavy oils. The technology and tools for this characterization of materials may also uncover novel advanced materials for energy, electronics and health sectors. The research program will provide training opportunities in nanotechnology, materials science, polymer processing and new oil field applications. | Uttandaraman Sundararaj | University of Calgary | $557,300 | $222,920 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2011/12 | Dissection of Wood Cell Wall Chemistry and Aquaporin Location Using Confocal Microscopy | Climate change is considered to be a major challenge for the future management and conservation of the boreal forest. This research will help us better understand how trees cope with environmental stress, particularly drought and freeze-thaw cycles, and is an important step toward introducing drought-resistant species into the landscape. Additionally, this work will contribute to diversifying fiber products and enhancing the potential to establish fast-growing trees on marginal agricultural land. | Uwe Hacke | University of Alberta | $160,250 | $64,100 |
| 2011/12 | An Ultra-Sensitive Device for Measuring and Imaging Trace Radioactive Impurities in Materials for Dark Matter Searches | Housed in the Centennial Centre for Interdisciplinary Science, the BetaCage instrument provides ultra-pure materials and instrumental sensitivity to identify trace elements in samples – services that are essential to the continued development of a world-class centre that can serve the needs of international researchers. For example, this equipment will provide a distinct advantage for the new projects at SNOLAB, the world's premier deep underground laboratory with research focused on neutrino physics and Dark Matter searches. | Darren Grant | University of Alberta | $299,999 | $120,000 |
| 2011/12 | Laboratory for Monitoring the Pathogenic Potential of Environmental Bacterial Populations | The identification of genes likely to play a role in the emergence of pathogenic strains, monitoring their dispersal in nature, and describing the interactions between existing and emerging pathogens in the environment are essential to allowing us to better predict and track potential outbreaks or epidemics. This facility will help Dr. Boucher's research program to detect the spread of human pathogens across the globe through molecular diagnostics. | Yan Boucher | University of Alberta | $262,524 | $100,000 |
| 2011/12 | Defining New Roles for Bcl-2 Family Members in Breast Cancer: Implications for Improved Treatment Options and Novel Therapies | The infrastructure will allow Dr. Goping to investigate breast cancer with a focus on developing new targeted therapies, and will be instrumental in efforts to develop more personalized treatment plans for cancer. These studies will be used to develop diagnostic tools that will guide the discovery and development of treatment and drug regimes. | Ing Swie Goping | University of Alberta | $481,435 | $192,574 |
| 2011/12 | Creation of a Laboratory to Study the Role of the Hsp90 Chaperone in Cancer | Building on existing strengths in cancer research, this project is aimed at characterizing and exploiting molecular changes that occur very early in the development of cancer. This knowledge will make diagnostic and therapeutic advances possible for the treatment of not only cancer, but also cystic fibrosis, diabetes, and neurodegenerative and age-related diseases. | Paul LaPointe | University of Alberta | $833,075 | $59,358 |
| 2011/12 | Laboratory for Investigation of Spatiotemporal Molecular Gradients in Biological Systems: Screening Infrastructure for Dynamic Molecular Tools, Materials, and Synthetic Extracellular Environments | Housed in the Centennial Centre for Interdisciplinary Science, and bringing a translational component to the Alberta Innovates Centre for Carbohydrate Science, the infrastructure will enable advanced investigation of membrane components, protein engineering and synthetic biology. The equipment will enable Dr. Derda to develop chemical tools to tackle biological responses and translational research of use to pharmaceutical and biomedical industries. | Ratmir Derda | University of Alberta | $572,396 | $228,958 |
| 2011/12 | Infrastructure for Telerobotic and Biorobotic Systems Laboratory (TBSL) | The Telerobotic and Biorobotic Systems Lab will increase the acceptance of robotic/telerobotic assistance as the preferred approach to minimally invasive operations and cardiac surgery/telesurgery, rehabilitation/telerehabilitation, and percutaneous cancer therapy and enable operating through several small incisions in the body, thus reducing patient morbidity and the length of hospital stay compared to open surgery. | Mahdi Tavakoli | University of Alberta | $446,806 | $170,000 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2011/12 | Advanced Analytical Facility for Environmental Soil Research | Addressing important environmental issues such as land reclamation and ground water contamination associated with the oil sands and petroleum industries, the research of Drs Siddique and Dyck will assist in the development of science-based management systems to protect our natural resources and will provide the fundamental knowledge required to devise better strategies for sustainable in-situ clean-up and management of contaminated sites in Canada. | Tariq Siddique Miles Dyck | University of Alberta | $555,024 | $216,460 |
| 2011/12 | Soil, Water, Air, Manure, Plant (SWAMP) Lab: Analytical Infrastructure for Studying Trace Element Cycling at Interfaces | Potentially toxic trace metals released to the environment from human activities can cause considerable environmental damage and ultimately impact human health. The SWAMP lab will house leading-edge equipment to aid the development of new environmental indicators and allow us to understand trends in environmental contamination. The research results will help to develop processes and policies with regard to water management, safe and secure drinking water, healthy aquatic ecosystems and reliable, quality water supplies. | William Shotyk | University of Alberta | $2,000,000 | $800,000 |
| 2011/12 | Capacity Building in Vision Research to Prevent Blindness | Vision loss causes a profound sense of despair and disability and creates long-term costs for society and a poorer quality of life. The research of Drs. MacDonald, Lehmann and Sauve aims to improve the vision health and well-being of Albertans. This infrastructure will build on international research excellence in ocular genetics, providing an opportunity to undertake innovative gene therapy research protocols. It will also build capacity for basic vision research and future innovative clinical trials to prevent blindness. | Ian MacDonald Ordan Lehmann Yves Sauve | University of Alberta | $467,117 | $186,846 |
| 2011/12 | Innate and Adaptive Killer Lymphocyte Responses | Viruses and cancer are significant causes of morbidity and mortality in Alberta and Canada. Development of effective immune system-based therapies and vaccines to prevent or counter infections and cancers are dependent on having an in-depth understanding of the molecular interactions controlling immune responses. Dr. Kane's research explores the contributions of subsets of lymphocyte cells in host defenses against infections and cancer. | Kevin Kane | University of Alberta | $971,485 | $388,594 |
| 2011/12 | The Role and Discovery of Bioactive Small Molecules from Marine Microbial Communities | The marine environment is thought to be one of the richest sources of natural products. A range of antibacterial, antiviral, anticancer and antifungal compounds have been isolated from both marine animals and plants. Dr. Case's laboratory aims to study these bioactive compounds at both the cellular and community levels. These compounds could be developed as a range of commercial products including antibiotics, antifouling treatments and biofuel processing. | Rebecca Case | University of Alberta | $250,301 | $100,000 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
|---|---|---|---|---|---|---|
| 2011/12 | Research Infrastructure for the Characterization of Interfacial Properties, Intermolecular and Surface Interactions in Soft Materials, Nanomaterials and Biological Systems | "Dr. Zeng's research team is interested in developing novel polymeric materials, thin films and surfaces with extreme adhesion capability in dry and wet environments, a self-healing ability, and anti-fouling properties. This state-of-the-art atomic force microscope will be used to characterize advanced polymeric materials, nanomaterials, biomaterials and complex fluid systems with potential applications for oilsands pipelines, tailings water treatment and waste treatment. | Hongbo Zeng | University of Alberta | $279,010 | $100,000 |
| 2011/12 | Lipid Metabolic Disorders | Obesity is a serious health problem in Canada, putting individuals at risk for numerous medical conditions including cardiovascular disease, hypertension, type 2 diabetes and Alzheimer disease. This infrastructure will ensure the continuation of important work on the identification of new biomarkers and pharmacological targets to improve these disorders and continue ground breaking research into discoveries and translation of the results into effective therapeutic applications. | Richard Lehner | University of Alberta | $990,393 | $396,157 |
| 2011/12 | Innovative Research Infrastructure to Propel Implementation and Evaluation of Comprehensive School Health | The Population Health Intervention Research Unit focuses on the importance of healthy eating and active living in childhood, in part through developing school programs to prevent chronic diseases. The infrastructure will allow program evaluation and enable new research results to be tested and translated back to programming in participating schools and the public at large. The program will also be expanded into more remote and rural schools, including Northern, First Nations and Métis communities. | Paul Veugelers | University of Alberta | $456,606 | $175,399 |
| 2011/12 | Super Resolution Imaging of Virus Host Interactions | Ribonucleic acid viruses, such as influenza and hepatitis C, cause the majority of virus-associated acute and chronic disease in humans, which have few treatment options, other than a limited number of vaccines. This new technology is poised to revolutionize our ability to view subcellular structures in 3D and will enhance our understanding of how they function, and how viruses disrupt their function. Through these studies we hope to devise strategies to block virus replication by interfering with their ability to take advantage of host cells. | Tom Hobman | University of Alberta | $1,000,000 | $400,000 |
| 2011/12 | Preterm Birth: Prediction, Prevention and Technology Commercialization | The infrastructure will allow Drs. Olson and Mitchell to develop technologies to predict pregnant women at risk of preterm birth (PTB), to discover new disease mechanisms, and to test new treatments to delay PTB, prolong pregnancy and improve maternal health. The new treatments resulting from this research program have strong commercial potential. | David Olson  Bryan Mitchell | University of Alberta | $729,105 | $291,642 |
| 2011/12 | Integrated Field and Laboratory Infrastructure for the Development and Characterization of Road Materials and Pavement Performance for Cold Regions | Dr. Bayat will establish integrated field and laboratory infrastructure to better understand the effects of cold climate factors on pavement materials and the performance, characterization and evaluation of recycled and waste materials for use in road construction. The research is aimed at developing sustainable practices and materials for road construction and creating value-added applications for recycled and waste materials, thereby increasing the lifespan and performance of pavements while reducing spending on road maintenance and waste material. | Alireza Bayat | University of Alberta | $637,357 | $254,753 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
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| 2011/12 | Holocene Archaeology of Northeast Asia | The Baikal Archaeology Project (BAP), which focuses on the human-environment interactions of the Holocene Hunter-Gatherers in Northeast Asia, is comprised of a multidisciplinary team of scholars with expertise in archaeology, anthropology, geochemistry, molecular biology, geophysics and environmental reconstruction. The BAP team is internationally recognized, works with collaborators of the highest caliber and represents a top priority in the University of Alberta's internationalization strategy. The technological innovation of the program includes the creation of digital archives to ensure long-term virtual access for the international academic community and the public. | Andrzej Weber Fiona Bamforth Robert Losey | University of Alberta | $1,984,831 | $793,932 |
| 2011/12 | Molecular Biology Laboratory for the Study of Metabolic Disorders | Dr. Jacobs' research program seeks to understand the complex interactions involved in chronic metabolic disorders. His work is focused on understanding the cellular, biochemical, genetic and epigenetic mechanisms through which nutrition influences the development of obesity, dyslipidemia and insulin resistance. The Molecular Biology Laboratory supports research to determine which nutritional, surgical or pharmaceutical approaches could be used to improve or prevent these metabolic disorders. | René Jacobs | University of Alberta | $413,454 | $165,382 |
| 2011/12 | Canada's Arctic Cratons, Kimberlites and Diamonds | "The infrastructure will bring the first multi-ion counting TIMS instrumentation to Canada and will open up new fields of geochemistry. This research will produce important results on exploration samples, allowing early targeting of potential deposits. These and other data will be integrated into Dr. Pearson's Canada Excellence Research Chair research program objective to produce a 4-D model of Canada's Arctic mantle that will aid not only diamond exploration, but also the search for metals and oils." | Graham Pearson Thomas Stachel Larry Heaman | University of Alberta | $2,000,000 | $800,000 |
| 2011/12 | Development of Tools and Techniques for Physical and Chemical Characterization of Oil Sand Interfaces | Dr. Thundat, the Canada Excellence Research Chair in Oil Sands Molecular Engineering, will develop a suite of instruments and techniques for understanding and controlling fundamental processes occurring at the interfaces between fluids and solids in the oil sands. Manipulation of these interactions, combined with sensors to continuously detect surface composition, will enable the development of improved, environmentally friendly and cost-effective techniques for extraction, upgrading and reclamation of tailings. | Thomas Thundat | University of Alberta | $2,000,000 | $800,000 |
| 2011/12 | NAIT Boreal Research Institute: Plant and Seed Technologies for Boreal Reclamation | novaNAIT Boreal Research Institute (nBRI) is located in Peace River, Alberta, 500 km northwest of Edmonton, in the heart of the boreal forest region. As a satellite campus of NAIT, nBRI has a 15-year track record in delivering applied research solutions and transferring knowledge to industry, small and medium-sized enterprises (SMEs), municipalities, and First Nations and Metis organizations. The project will equip a 1,000 ft2 modular research laboratory that will test seed viability, dormancy, and germination and will include growth chambers, bench equipment, and cold storage. | Hugh Seaton | NAIT | $2,000,000 | $800,000 |

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| 2011/12 | Oil Sands Environmental Sustainability: Centre for Green Chemistry and Engineering at NAIT | The project will bring NAIT's applied research capacities in chemistry and engineering, to work with SMEs and oil sands operators, for validating existing fluid tailings treatment technologies, and assist in further developing new technologies. The team will approach the problem from an end-to-end systems perspective, i.e. the de-watering and stabilization of fluid tailings, and utilization of the released process-affected water. Accurate measurement and monitoring systems will also be required for compliance. | Haneef Mian | NAIT | $2,526,637 | $799,864 |
| 2011/12 | Green Building Technologies Project | The GBT Lab and Demonstration Centre, a 650m2 facility is comprised of 20 reclaimed intermodal shipping containers. Researchers will conduct industry-driven product and technology prototyping, redesign, testing and development. The new facility will augment the two-storey, 131m2 GBT shipping container office. The Lab structure itself will be used to construct Net Zero homes and conduct research to meet NZEH and Architectural Ecology targets, with project activities occurring inside, within, and on the outside of the facility. | David Silburn | SAIT | $1,999,050 | $799,525 |
| 2010/11 | Electron Paramagnetic Resonance Spectroscopy Facility for Nanomaterials and Advanced Catalysis | The research equipment purchased with this award will allow Drs. Rene Boeré and Paul Hayes to uncover novel nanomaterials and advanced catalysis and provide scientific instrumentation that presently does not exist in Canada. The research may lead to improved drug development, materials synthesis, and the production of value added chemicals. | Rene Boeré Paul Hayes | University of Lethbridge | $441,105 | $176,004 |
| 2010/11 | The brain in action: A research facility for the study of sensory and motor integration in healthy and neurological populations | The award will help support the creation of a research facility to study sensorimotor functions in healthy and neurological populations. The research supported by this award may lead to improved diagnosis and treatment of common neurological disorders such as stroke, Parkinson's disease and epilepsy. | Claudia Gonzalez | University of Lethbridge | $244,712 | $97,885 |
| 2010/11 | Molecular characterization of disease mechanisms involved in genetically determined cardiomyopathies | This award will support the purchase of equipment that will enable Dr. Brenda Gerull to further understand the novel genetic factors influencing cardiovascular disease. The equipment and research will also provide valuable opportunities for students to advance their knowledge of cardiovascular disease aetiology, provide training for students in advanced scientific methods and, ultimately, to improvements in healthcare. | Brenda Gerull | University of Calgary | $617,167 | $246,866 |
| 2010/11 | Steroid hormone sample preparation and mass spectrometry laboratory | The equipment supported by this award will be used to investigate the body's responses to steroid hormones. Dr. Wynne-Edwards laboratory will be a powerful tool in improving our fundamental understanding of individual responses to both chronic and acute stress, leading to reduced chronic disease, improved mental health, and healthier children at birth. | Katherine Wynne-Edwards | University of Calgary | $999,950 | $299,598 |

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| 2010/11 | Fluorometric instrumentation for the measurement of sub-cellular microenvironments | This award will provide Dr. Yates with the required equipment to further advance the field of cell biology research in Alberta. The capabilities of new equipment will also be important to support Alberta's research initiatives in the areas of fundamental biology of immune cells, disease states and the invention and advancement of research tools. | Robin Yates | University of Calgary | $650,935 | $227,923 |
| 2010/11 | Translational Health Research Collaboratorium | The award will support the development of a custom database for a network of clinical and social scientists with common goal of conducting world class translational health research. Drs. Kaplan, Saunders and Coffin's Collaboratorium will be a powerful tool in designing future programs for the treatment and prevention of gastrointestinal and hepatology diseases. | Gilaad Kaplan Chad Saunders Carla Coffin | University of Calgary | $438,481 | $175,393 |
| 2010/11 | Mechanotransduction in cardio-vascular tissues: role of residual stresses explored by real-time in situ microscopy coupled with biomechanical measurements | This award will support the purchase of equipment that will enable Dr. Di Martino to investigate how changes in the structure and function of the components of blood vessels and heart tissues can lead to serious cardio-vascular ailments. The findings from preliminary research may lead to further developments in novel treatment options for these diseases. | Elena Di Martino | University of Calgary | $297,389 | $81,240 |
| 2010/11 | Open Social Mobile Systems for eLearning Research (OSMoSYS) | Drs. Dron and McGreal will combine their expertise in open social mobile systems to develop four synergistic components that researchers at Athabasca University believe characterize the next generation of educational technology systems; Open (free) content, Social networking, Mobile devices and ubiquitous (sensor based) triggers to learning opportunities. | Jon Dron Rory McGreal | Athabasca University | $951,305 | $346,152 |
| 2010/11 | High-content functional genomic analysis of immune responses | The award supports the purchase of specialized equipment for Dr. Foley's research program to study genomics and cell biology. The new equipment is essential for his team to observe novel immune responses and will complement the facilities already available at the University of Alberta's high-content imaging systems for cell culture. | Edan Foley | University of Alberta | $838,247 | $295,299 |
| 2010/11 | Molecular microbiology laboratory for ecology and physiology (M2LEAP) | This award will help Drs. Lanoil and Stein establish a laboratories is to understand the structure and function of organisms behind the production and consumption of greenhouse gasses. The researchers will investigate how greenhouse gasses may be regulated by microbial activity and the associated climate change impact. The presence of this infrastructure will establish the laboratory as the centre for environmental microbial ecology and physiology in Canada. | Brian Lanoil Lisa Stein | University of Alberta | $528,869 | $206,000 |

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| 2010/11 | Mass Spectrometry for the Analysis of High Molecular Weight Protein Complexes | The award will purchase leading-edge mass spectrometry (MS)-based tools to characterize biologically important high molecular weight proteins and protein complexes. Dr. Klassen's laboratory will provide powerful tools in the discovery and development of novel strategies for the treatment of a variety of diseases and microbial infections which will lead to the development and commercialization of new drugs. | John Klassen | University of Alberta | $1,099,717 | $439,887 |
| 2010/11 | The Last Best West: The Alberta Land Settlement Infrastructure Project | This award will support the equipment to enable Drs. Baskerville, Carter and Gouglas to develop a Alberta land settlement database. The combination of geo-physical, census and Homestead data creates a unique infrastructure for understanding early land use in Alberta. The data will be important to support Alberta's research initiatives in the areas of natural resources and land management. | Peter Baskerville Sarah Carter Sean Gouglas | University of Alberta | $984,505 | $393,802 |
| 2010/11 | Facility for the Fundamental Characterization and Application of Advanced Materials | Dr. Serpe's research will investigate polymeric materials, metal/inorganic nanoparticles, and polymer/nanoparticle hybrid materials in the development of advanced materials. The research supported by this award may lead to materials for a variety of industrial uses such as improved surface coatings for lubrication, ultrasensitive biosensing/spectroscopic techniques, antibacterial polymeric coatings, and photonic materials. | Michael Serpe | University of Alberta | $370,369 | $128,000 |
| 2010/11 | Multiparametric Flow Cytometry System for the Development and Characterization of Environmental Biotechnology Remediation Strategies | Equipment purchased with this award will be used for the development and characterization of microorganisms used to degrade contaminants into non-harmful end products. Dr. Ulrich will investigate several research areas such as removing pharmaceuticals and nanomaterials in drinking water systems and greenhouse gases from the oil sands industry. | Ania Ulrich | University of Alberta | $334,294 | $125,000 |
| 2010/11 | Small animal PET/CT: An innovative preclinical multimodality molecular imaging platform for translational research | The infrastructure supported by this award will augment Dr. Wuest's research by equipping his team with the technology to extend their innovative translational cancer research program. Molecular imaging in living subjects offers distinct advantages when compared with conventional in vitro and cell culture research techniques. His research may lead to a faster diagnosis of the disease and more effective treatments. | Frank Wuest | University of Alberta | $1,974,632 | $789,853 |
| 2010/11 | The Alberta Dialysis Databank (ADD) | The equipment purchased with this award will enable the is development of an innovative databank, recording hemodialysis treatment strategies and outcome data from all patients treated in Alberta. Dr. Tonelli 's laboratory will be a powerful tool in designing future programs for the treatment and prevention of kidney failure. The databank is also expected to lead to the discovery of new therapeutic technologies. | Marcello Tonelli | University of Alberta | $1,559,115 | $623,646 |

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| 2010/11 | State-of-the-Art Ultrasound Biomicroscope for the Evaluation of Myocardial & Vascular Function in Maternal, Fetal and Placental Disease in Small Animals | The award will support in vivo ultrasound biomicroscope technology to explore fetal cardiovascular and pulmonary vascular development. A better understanding of myocardial and vascular functions may lead to new treatments for heart disease and to new therapeutic fetal and neonatal cardiovascular diseases and preventative strategies. | Lisa Hornberger Sandra Davidge Bernard Thébaud | University of Alberta | $597,997 | $239,199 |
| 2010/11 | Facility to Support the Bench-to-bedside Development of Targeted Drugs and Drug Delivery Systems for Improved Therapeutic Performance | The award supports research in the development of new drugs and drug delivery systems. The results of Drs. Lavasanifar, Kaur and Uludag's research may help us to develop better therapeutic vaccines to treat cancer, engineered biopolymers that deliver mediators of bone growth and/or bone-regeneration in osteoarthritis and new agents for the prevention and treatment of hepatitis C. | Afsaneh Lavasanifar Kamaljit Kaur Hasan Uludag | University of Alberta | $944,034 | $377,614 |
| 2010/11 | Electrophysiological Imaging and Photostimulation of Neuron-Glia Networks in Ex Vivo Neurological Disease Models | The imaging equipment purchased with this award will be used to develop novel pharmacological strategies for treatment of neurological diseases. The results of Drs. Ballanyi, Smith and Todd's research may help us to develop better treatments for disorder or injury of the brain, spinal cord or nervous system. | Klaus Ballanyi Peter Smith Kathryn Todd | University of Alberta | $1,990,927 | $796,371 |
| 2010/11 | Oxidative Stress and Stress Signaling Facility | The facility, established with the support of this award, will allow Dr. Koltz to conduct innovative research in the field of drug safety and risk assessment. The facility will also support cutting edge research on understanding drug side effects based on oxidative stress. | Lars Klotz | University of Alberta | $452,796 | $181,118 |

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| 2010/11 | An aquatic center for the evaluation of the effects of water quality on fish health | Dr. Tierney will use the Infrastructure for environment-animal interaction research for the evaluation of the effects of water quality on fish health. The equipment is essential to determine how changes in water flow,water quality (e.g. temperature, salinity, sediment load and dissolved contaminants) affect diverse fish species. | Keith Tierney | University of Alberta | $200,505 | $80,000 |
| 2010/11 | Facility for the Experimental Characterization of Metamaterial Imaging Devices, Radiating Structures, and Scattering Surfaces | Dr. Iyer's research seeks to develop new directions in classical areas of electromagnetics and RF/microwave engineering, but is centered around the study of 'metamaterial' technologies. Metamaterials are artificial materials engineered to have properties that may not be found in nature and may have many diverse applications in ICT, aerospace, solar power, and invisibility-cloaking to name a few. The new laboratory will also be important to support Alberta's research initiatives in the area of applied electromagnetics research. | Ashwin Iyer | University of Alberta | $611,985 | $240,000 |
| 2010/11 | Microparticle Engineering Facility | This award will support the equipment needed to establish a facility, necessary to advance Dr. Vehring's research program in the field of particle engineering. Structured microparticles have significant commercial potential, several development programs for respiratory therapeutics are underway. The research may also enable a variety of novel products in the pharmaceutical, biotechnology, and food industries. | Reinhard Vehring | University of Alberta | $536,716 | $200,000 |
| 2010/11 | Ion homeostasis - from bench to bedside | Drs. Alexander, Casey and Cordat will use the award to purchase the equipment required to understand the fundamental molecular mechanisms behind many of diseases including disorders of the kidney, heart and eye. A better understanding of ion homeostasis may lead to new treatments for these disease and to new therapeutic strategies. | Robert Todd Alexander Joseph Casey Emmanuelle Cordat | University of Alberta | $726,973 | $290,786 |
| 2010/11 | A hyperspectral infrared imaging facility for the non destructive spectroscopic scanning of geological core | Equipment purchased will further the study of spectral analysis and digital imaging of sediments for mineral exploration. The capabilities of Dr. Rivard's new laboratory will be important to support Alberta's research initiatives in the area of natural resource development including oil sands exploration recovery and processing, while mitigating environmental impacts. | Benoit Rivard | University of Alberta | $381,618 | $152,647 |
| 2009/10 | A Scaleable Optical Sensor Network for Ecosystem Health | Equipment purchased will be used to implement a network of optical monitoring and remote sensing devices to detect changes in ecosystems, such as forests, cropland, or rangeland. The project will gather extensive and integrated environmental data in a cost-effective way, while providing essential information for the sustainable management of Alberta's resources. | John Gamon | University of Alberta | $266,703 | $100,000 |

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| 2009/10 | Infrastructure for Understanding the Molecular Basis and Treatment of Cardiac Arrhythmias | The award supports cardiovascular research and the development of new anti-arrhythmic drugs, which would help regulate abnormal heart rhythms. The research will provide fundamental knowledge necessary for developing new, cost-efficient, and more effective therapies for the treatment and prevention of cardiac arrhythmia and sudden death. | S.R. Wayne Chen | University of Calgary | $988,797 | $395,519 |
| 2009/10 | Ultraperformance Liquid Chromatography - Mass Spectrometry Facility for Plant Bioproducts Analysis | The award will purchase equipment to bolster research in plant metabolism. The equipment will enable the researchers to reliably identify and measure important compounds made by plants that could have applications in pharmaceuticals, flavours, fragrances, insecticides, and other chemical formulations. | Peter Facchini<br> Dae-Kyun Ro | University of Calgary | $1,076,348 | $430,540 |
| 2009/10 | Advanced Laboratory for Ubiquitous Sensor Network | Equipment purchased with this award will be used to establish a network of self-sustaining (autonomous) sensors to monitor various environments, including agricultural areas and oil and gas fields. The equipment and research will also provide valuable training opportunities to students interested in developing wireless sensor network technology and data analysis skills. | Henry Leung | University of Calgary | $980,825 | $392,331 |
| 2009/10 | Molecular Enzymology Laboratory | Equipment purchased will further the study of enzyme kinetics, and the effects of drugs on enzyme behaviour, research that has implications for a basic understanding of enzymes, and for pharmaceutical applications such as understanding drug metabolism. A better understanding of the interaction of drugs with these enzymes may lead to new treatments for Parkinson's disease and to new therapeutic anti-smoking strategies. | Andrew Holt | University of Alberta | $300,801 | $120,321 |
| 2009/10 | Platelet-Angiogenesis Research Infrastructure for Development of Novel Angiogenesis Regulating Pharmaceutica Life Sciences | The equipment purchased with this award will support research into cardiovascular disease and cancer in Alberta. Dr. Jurasz aims to better understand the role of blood platelets in regulating the formation of new blood vessels, and investigate their potential to be used as part of a new treatment for damaged tissue from heart disease or cancer. | Paul Jurasz | University of Alberta | $493,171 | $197,275 |
| 2009/10 | In Vivo Cellular Imaging of Brain Structure and Function in Models of Neurological and Neuropsychiatric Disease | The award will support the purchase of imaging equipment, including an in vivo multiphoton imaging system that allows researchers to see live, real-time, and high resolution views of cells, specifically neurons and glia. The research supported by this award may lead to improved stroke therapy. | Ian Winship | University of Alberta | $999,810 | $399,924 |
| 2009/10 | An Analysis Suite for Characterizing of Smart Polymer/Nanoparticle Composites | The award will purchase specialized equipment, including a differential photocalorimeter and an infrared camera which will be used to study smart polymer/nanoparticle composites. These materials undergo changes when they are exposed to different stimulus like a magnetic field or light. The research will characterize the new materials to better predict and manipulate their unique behaviour, with the long term aim of developing them for biomedical applications. | Anastasia Elias | University of Alberta | $192,259 | $76,903 |

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| 2009/10 | Infrastructure for Synthesis of Materials for Alternative Energy Applications | The equipment supported by this award will be used to investigate lower cost manufacturing processes for commercial carbon nanotube composites. The award also supports a demonstration facility for friction stir welding, a new and highly efficient welding technique for joining high strength steels, which reduces metal fatigue, wear, and oxidation compared to traditional methods. | Adrian Gerlich | University of Alberta | $384,007 | $140,000 |
| 2009/10 | Biodiversity Science and Conservation Ecology Group | The award will support the purchase of essential computing and field equipment for use in biodiversity conservation and wildlife management research. The research aims to develop tools for better regional conservation planning and improved sustainable forestry management practices, with the long term goal of protecting biodiversity in Alberta. | Scott Nielsen Fangliang He | University of Alberta | $336,830 | $115,489 |
| 2009/10 | Petroleum Microbiology Research Laboratory | Equipment purchased with this award will be used to understand the science of anaerobic (oxygenless) petroleum biodegradation. A better understanding of anaerobic hydrocarbon metabolism could lead to improved tailings pond reclamation, increased methane production from marginal reservoirs, and more effective natural environmental reclamation. | Lisa Gieg | University of Calgary | $482,559 | $193,024 |
| 2009/10 | Infrastructure for Investigation of Organic Nitrates and Reactive Halogens in Laboratory Experiments and in Ambient Air | Dr. Osthoff's atmospheric science research will improve our understanding of pathways that lead to formation of secondary pollutants such as ozone and airborne particulate matter that affect people's health and climate. The atmospheric chemistry research equipment will allow more accurate impact assessments of emissions, and provide scientific instrumentation that presently does not exist in Canada. | Hans Osthoff | University of Calgary | $948,998 | $339,691 |
| 2009/10 | Cell and Molecular Biology Suites for Studying Reproductive Development in Canola and Arabidopsis | The research equipment purchased with this award will allow Dr. Samuel to uncover novel genetic switches that control canola plant reproduction. Identification and manipulation of these novel genes will directly impact canola crop-yield. The infrastructure funds will build cell and molecular biology suites in the Department of Biological Sciences at the University of Calgary. | Marcus Samuel | University of Calgary | $973,538 | $280,000 |
| 2009/10 | Establishment of a Molecular Parasitology Laboratory | Drug resistance in parasites is an important economic and animal welfare problem for livestock agriculture and a major global human health problem. The proposed infrastructure will be used to investigate molecular mechanisms of drug resistance and apply the knowledge to improved diagnostics and control. | John Gilleard | University of Calgary | $544,505 | $212,427 |
| 2009/10 | Germ Line Stem Cell Research Facility | Advances in germ line stem cell research affect biomedical research through generation of animal models and tissue regeneration, agricultural research through improved reproductive efficiency and dissemination of superior livestock genetics, and animal conservation through preservation of genetic material from rare and endangered animals. | Ina Dobrinski | University of Calgary | $605,131 | $240,938 |

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| 2009/10 | Environmental Impact of Prion Diseases | Prion diseases have had an enormous economic and social impact. Of particular importance to Alberta are bovine spongiform encephalopathy (cattle) and chronic wasting disease (deer, moose, elk). This application emphasizes the environmental impact of prion diseases, focusing on the binding of prions to soil, an interaction that enhances infectivity. | Judd Aiken | University of Alberta | $932,206 | $340,000 |
| 2009/10 | Research Facility for the Characterization of Nano-based Biomaterials for Gene Delivery Applications | My research program is focused towards the design of cationic glycopolymers and glyconanoparticles for gene delivery applications. The acquisition of the following infrastructure, widefield microscope, zeta potential analyzer and differential scanning calorimeter/ thermogravimetric analyzer, will strongly enhance our research capabilities and hence we expect to make significant progress in this highly innovative field of carbohydrate-based nanocarriers. | Ravin Narain | University of Alberta | $304,066 | $100,000 |
| 2009/10 | Establishment of Novel Integrated Xenopus Oocyte Heterologous Expression Technologies for the Study of Nucleoside and Other Membrane Transporter Proteins. | Discovered in the YOUNG laboratory, this molecular study of how CNT and ENT proteins move nucleosides across plasma and intracellular membranes will combine the unique versatility/power of heterologous expression in Xenopus oocytes with other technological innovations to improve and expand therapeutic applications of nucleosides in cancer and other diseases. | James D. Young | University of Alberta | $939,858 | $340,000 |
| 2009/10 | Development of a Prion Agent Preparation Laboratory | This infrastructure will support my prion research laboratory focusing on the pathogenesis of prion agents and the characterization of chronic wasting disease. The research goal is to understand the molecular mechanisms of a prion infection. | Debbie McKenzie | University of Alberta | $208,113 | $80,000 |
| 2009/10 | Enhancing mining efficiency and decreasing environmental impact using Scanning Probe Microscopy and X-ray Fluorescence Micro-Probe | Efficient and environmentally responsible mineral (coal and oil sands ) processing is central to the continuing success of the natural resource based industry. But there are significant challenges. The industry requires step-out technology to exploit more complex forms of minerals and coal and deal with unpredictable variability of oil sands ores. The cyclical nature of the industry has resulted in a general reduction in training programs. We need to develop a critical mass in world-class mineral research and training. | Zhenghe Xu | University of Alberta | $797,971 | $313,798 |
| 2009/10 | In vivo microscopy and real-time quantitative PCR infrastructure to investigate neurodegenerative disorders. | Diseases affecting the central nervous system are a major cause of death and disability in Alberta and Canada. The establishment of the Neurodegeneration Research Unit at the University of Calgary will provide infrastructure to investigate causes and treatments for these pathologies. | Roger J. Thompson Shalina Ousman | University of Calgary | $907,839 | $363,136 |
| 2009/10 | Infrastructure for the Environmental Surface Research Laboratory | This fund will be used to equip an environmental surface research laboratory with state of the art equipment for use in research related to nanoparticles, microbes, and organic pollutants, and their interactions with engineered and natural surfaces. | Yang Liu | University of Alberta | $269,450 | $105,000 |

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| 2009/10 | Laboratory for the Fabrication & Testing of FRET and Plasmon-enhanced Nanostructured Photovoltaic Devices | Improvements in the design and processing of organic semiconductors coupled with advances in nanotechnology render possible medium to high efficiency solar cells at a fraction of the cost of conventional silicon-based photovoltaics. The fabrication & testing of such devices is the subject of the proposed research. | Karthik Shankar | University of Alberta | $204,902 | $80,000 |
| 2009/10 | Targeting Signaling Pathways in Heart Failure: Potential for New Therapies | The current one year mortality rate after diagnosis of HF remains disturbingly high at between 25- 40%, not to mention the human toll of patient suffering prior to deaths. Our project will create a state-of-the art and highly specialized system in order to study the key elements of heart failure in experimental models which will be complemented by parallel experiments in human explanted hearts with the ultimate aim to foster our understanding of human heart failure and to create new therapies. | Gavin Y. Oudit | University of Alberta | $905,032 | $211,430 |
| 2009/10 | Laboratory for Polymer Electrolyte Fuel Cell Research | Polymer electrolyte fuel cells (PEFCs) can improve energy efficiency and reduce negative emissions. In order for PEFCs to be commercially viable, their cost has to be reduced and their performance enhanced. Novel micro-fabrication techniques and computational design will be used to develop bio-inspired flow fields and electrodes for PEFCs that achieve the necessary cost reductions and performance improvement for commercialization. | Marc Secanell Gallart | University of Alberta | $211,869 | $81,854 |
| 2009/10 | Molecular mechanisms of PCSK9 and ABCG1 in the maintenance of cholesterol homeostasis | Atherosclerotic heart disease is the number one killer in Canada. The requested infrastructure is critical to the success of my team's research on novel molecular mechanisms in cholesterol homeostasis and atherosclerosis. Our findings will lead to the creation of new therapies to reduce the disease. | Dawei Zhang | University of Alberta | $672,890 | $269,158 |
| 2009/10 | Infrastructure for studying both the biophysics of infectious prion oligomers and the prion disease pathology they induce. | The infrastructure will be used to: I) isolate and characterize the biophysical properties of infectious prion protein oligomers ; 2 ) produce 3D reconstruct ions of neurons in mouse brain slice cultures after exposure to prions; and 3 ) investigate the early stages of prion disease pathogenesis in vitro. | Valerie Sim | University of Alberta | $1,000,000 | $400,000 |
| 2009/10 | A high pressure chemisorption analyzer for characterization of heterogeneous catalysts under industrial conditions | Funds are requested to purchase equipment for the characterization of heterogeneous catalysts under industrial conditions . The equipment consists of a chemisorption analyzer, which is capable of performing temperature programmed reactions, and a mass spectrometer to analyze products. | Vinay Prasad Natalia Semagina | University of Alberta | $323,064 | $129,175 |

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| 2009/10 | Analysis of the role of genetically defined inter-neurons in the operation of the locomotor and respiratory CPGs. | The studies proposed in this application will investigate the structure and function of neural networks that underlie simple rhythmic behaviours such as breathing (respiration) and walking (locomotion). The results of these studies will enable us to identify the developmental processes that are essential for the assembly of these neural networks, and allow us to better understand how the respiratory and locomotor behaviours are initiated. | Simon Gosgnach | University of Alberta | $929,302 | $371,721 |
| 2008/09 | Airborne electromagnetic sea ice thickness sensor | Airborne electromagnetic sea ice thickness sensor - Acquiring this equipment will improve the ability to accurately measure and monitor ice thickness changes, providing valuable insight into how sea ice levels may indicate changes in the climate. | Christian Haas | University of Alberta | $401,250 | $100,000 |
| 2008/09 | Laboratory for passive seismic imaging of earth processes | Laboratory for passive seismic imaging of earth processes - This award is to develop a laboratory for passive seismic imaging of the earth's processes which will use naturally occurring mini earthquakes as a source of seismic waves instead of artificial methods such as dynamite or air guns. Equipping this laboratory offers the opportunity to advance a wide range of areas including earthquake hazard analysis, CO2 capture and storage, oil recovery efficiency and the earth's physical evolution. | David Eaton | University of Calgary | $808,090 | $303,236 |
| 2008/09 | A transgenic zebrafish facility to study prion proteins, neurodegenerative disease and photoreceptor regeneration | A transgenic zebrafish facility to study prion proteins, neurodegenerative disease and photoreceptor regeneration - the award will advance the study of prion function and retinal degenerative disease as Zebrafish share similar genetic material with mammals and are useful models for studying human diseases. Such research will potentially assist in the detection and treatment of BSE, CWD, Creutzfeldt-Jakob disease and retinal degenerative diseases such as macular degeneration. | William Allison | University of Alberta | $206,265 | $81,050 |
| 2008/09 | Post-translational modifications and the proteome during Apoptosis | Post-translational modifications and the proteome during Apoptosis The funding for purchase of a high definition mass spectrometer system will further the understanding of Multiple Myeloma, a form of cancer of the plasma cells. The research aims to generate insight into cancers that appear to be resistant to conventional treatments. This research may lead to the discovery of more effective treatments for these cancers. | Richard Fahlman | University of Alberta | $984,205 | $393,682 |
| 2008/09 | Development of a comprehensive platform for the value-added utilization of poultry products | Development of a comprehensive platform for the value-added utilization of poultry products - The funding to complement the value- added poultry program at the University of Alberta. Some of Dr. Wu's research projects include an egg biorefinery which intends to develop ways to make use of all parts of the egg from the shell to the yolk. A value-added meat program is also incorporated into this award, and will attempt to determine way s to increase the nutritional value of poultry and overall efficiency of the poultry industry. These initiatives will assist in strengthening Alberta's agriculture industry and may develop products which will increase the health of Albertans. | Jianping Wu Mirko Betti Robert Renema | University of Alberta | $341,182 | $120,000 |

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| 2008/09 | Quantitative photoacoustic imaging technology development | Quantitative photoacoustic imaging technology development - The award will assist in developing a new molecular imaging technology to generate images, such as the amount of oxygen that a body tissue uses, to monitor the development of diseases such as cancer and heart disease, as diseased tissue uses less oxygen than healthy tissue. | Roger Zemp | University of Alberta | $373,981 | $135,000 |
| 2008/09 | Obesity Research Laboratory | Obesity Research Laboratory - Equipment purchased will further the study of the role of gastrointestinal signals in regulating food intake, which aims to better understand the complex nature of obesity and the physiological mechanisms that play a key role in obesity in both humans and animals. Dr. Chelikani's laboratory will be a powerful tool in designing future programs for the treatment and prevention of obesity. | Prasanth Chelikani | University of Calgary | $1,140,695 | $456,278 |
| 2008/09 | Functional Genomics Laboratory for deciphering gene-regulatory and genetic-interaction networks | Functional Genomics Laboratory for deciphering gene-regulatory and genetic-interaction networks - This award will help equip a laboratory for functional genomics which includes an SGA (synthetic genetic array) suite and a microarray suite. With these tools, Dr. Chua aims to uncover and better understand the genetic origin of many human diseases. | Gordon Chua | University of Calgary | $1,186,860 | $474,745 |
| 2008/09 | A microbiological culture and biochemistry laboratory for carbohydrate research | A microbiological culture and biochemistry laboratory for carbohydrate research - The award supports exploring a novel approach to the treatment of cancer and other infectious diseases that combines the areas of organic chemistry and microbiology. This research has the potential to impact the area of vaccination and the treatment of cancer and infectious diseases through the study of the interaction between carbohydrates and proteins, which plays a role in conditions such as cancer, viruses, autoimmune diseases and inflammation. | Chang-Chun Ling | University of Calgary | $877,460 | $350,983 |
| 2008/09 | Laboratory for computational structural biology: Theoretical gateway to molecular origins of selective ligand binding to membrane proteins | Laboratory for computational structural biology: Theoretical gateway to molecular origins of selective ligand binding to membrane proteins - This award will help develop a greater understanding of how proteins on the cell surface or on a membrane within a cell bind to other molecules, which may become a powerful tool for advancing the effectiveness of therapeutic drugs and may provide insight into new methods of drug delivery. | Sergei Noskov | University of Calgary | $756,419 | $194,352 |
| 2008/09 | Mass spectrometry for elucidation of glycan structure and post translation modification of proteins in glycobiology | This award will be used to purchase a specialized mass spectrometer to boost capability to investigate the chemical biology of carbohydrates. This new equipment will also be made available to other researchers interested in glycobiology. The aim is to broaden the basic understanding of glycobiology, as well as to develop carbohydrate-based vaccines and therapeutics. | David Bundle | University of Alberta | $973,162 | $369,776 |
| 2008/09 | Bioenergy and the uncultured microbial majority | This award will help establish a new environmental microbiology laboratory at the University of Calgary to further the understanding of how microbial species and novel biotechnological applications of bacteria might advance the use of microbial activity for important environmental and industrial needs. | Peter Dunfield | University of Calgary | $834,328 | $329,393 |

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| 2008/09 | Harnessing leading edge technology for osteoarthritis therapeutics; unprecedented resolution of cartilage cell signaling and macromolecular interaction with synovial fluid | Many Canadians suffer from osteoarthritis, a disease characterized by the wearing away of cartilage and a decrease in the amount of protective synovial fluid in the joint. This award will support the purchase of a highly sensitive confocal microscope that allows researchers to observe live cells and molecules for longer periods of time compared to earlier confocal technology. The equipment will be used to investigate potential new treatments for osteoarthritis and the research will contribute to providing a long term solution for people living with osteoarthritis. | Wayne Giles Andrea Clark Tannin Schmidt | University of Calgary | $1,283,400 | $513,360 |
| 2008/09 | Microfocus X-ray Diffractometer | The grant will modernize equipment to improve the quality of x-ray data collected at the University of Calgary. The research is focused on the development of potential antiviral medications and treatment options for norovirus gastroenteritis and similar diseases. | Kenneth Ng | University of Calgary | $722,019 | $288,808 |
| 2008/09 | Nano/micro-encapsulation of nutraceuticals and bioactives for functional foods | Researchers will combine their expertise in nanotechnology and food science in order to develop new food ingredients with superior properties. The award will support the purchase of equipment to help in the study of using Alberta crops, such as barley and flax, to produce high-value ingredients which deliver nutraceuticals into foods, creating functional food products. The research has the potential to boost the value of Alberta crops, and improve the nutritional value of processed foods. | Marleny Aranda Saldana Jonathan M. Curtis Lingyun Chen | University of Alberta | $432,484 | $168,700 |
| 2008/09 | In vivo evaluation of immune tolerance | The award will help improve the study of autoimmune disorders through further understanding of the role of the thymus in this regulatory process. It is anticipated that this new knowledge will have an impact on the fields of organ transplantation and chronic infections such as Hepatitis B and C, and HIV. | Troy Baldwin | University of Alberta | $150,700 | $60,280 |
| 2008/09 | Molecular Signatures Platform to Characterize Aggressive and Indolent Prostate Cancer | The project aims at identifying biomarkers for aggressive prostate cancer that could be implemented clinically prior to treatment. Researchers will investigate the most promising genes and their secreted proteins as tissue and serum biomarkers using automated high-throughput tissue and proteomics scanning systems. | Tarek Bismar | University of Calgary | $160,001 | $64,000 |
| 2008/09 | From the microcirculation to whole-body function: laboratories to investigate the effects of aging and physical activity on vascular control and functional capacity | This award will assist in establishing a laboratory designed to further understand the relationships between aging and physical activity on blood vessel regulation and will explore physical activity as a treatment option to slow down or reverse the degradation of arterial blood vessels. | Darren DeLorey | University of Alberta | $435,052 | $174,000 |

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| 2008/09 | Laboratory for the development and in situ characterization of complex solid/liquid interfaces: from biomimetic materials to greener catalysts | The award will be used towards equipment to investigate the bonding of small molecules or ions in solution to surfaces and has the potential to impact many areas, including antibiotic resistance and the development of new catalysts for the energy and ICT sectors. | Julianne Gibbs-Davis | University of Alberta | $652,600 | $240,000 |
| 2008/09 | Infrastructure for the air quality characterization and control research laboratory | Dr. Hashisho aims to develop new technologies and materials to better control air quality. One particular area of concern is the emission of volatile organic compounds (VOC's) which pose serious health and environmental implications. VOC's are emitted from sources such as paints, furniture, flooring materials, perfumes, and petrochemical-based materials. The infrastructure purchased will assist Dr. Hashisho in creating new, cost-effective ways of controlling these emissions. | Zaher Hashisho | University of Alberta | $361,801 | $125,000 |
| 2008/09 | Structural and functional study of membrane proteins in disease | This award will help develop a modern membrane protein expression, purification, and crystallization facility with equipment capable of investigating how the functions of membrane proteins contribute to diseases such as Type 2 Diabetes, blindness, and Alzheimer's. The findings from preliminary research may lead to further developments in novel treatment options for these diseases. | Joanne Lemieux | University of Alberta | $569,641 | $227,856 |
| 2008/09 | Establishment of a facility to study carcinogen metabolism and transmembrane transport | The award will help further investigate cellular metabolism, focusing on the transport of carcinogens across cell membranes. The research will study arsenic and tobacco smoke, two major contributors to cancer, and aims to develop new treatment options for the disease. | Elaine Leslie | University of Alberta | $614,072 | $210,000 |
| 2008/09 | Bacterial biofilm cultivation and imaging with confocal microscopy | This award will help develop a greater understanding of how proteins on the cell surface or on a membrane within a cell bind to other molecules, which may become a powerful tool for advancing the effectiveness of therapeutic drugs and may provide insight into new methods of drug delivery. | Shawn Lewenza | University of Calgary | $483,306 | $193,322 |
| 2008/09 | Molecular analysis of the host-pathogen interface | The award will establish a state-of-the-art molecular pathogenesis laboratory, which will support research aimed at developing alternative treatment strategies to fight bacterial infections. The researcher's approach is to identify compounds that interfere with the molecular interactions at the interface between bacterial pathogens and their hosts. | Stefan Pukatzki | University of Alberta | $444,680 | $177,872 |
| 2008/09 | Tools for Modeling DNA Damage and Repair | The award will purchase computer resources for the research program at the University of Lethbridge. By using computer modelling, Dr. Wetmore investigates how our DNA is damaged by carcinogens and how our bodies use enzymes to repair this damage. The DNA modelling aspect of Dr. Wetmore's research has the potential to be used for the design of new molecules to combat diseases such as cancer. | Stacey Wetmore | University of Lethbridge | $353,107 | $122,087 |

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| 2008/09 | Memory networks: ensemble recording, functional imaging, and neurocomputational studies on the biology of memory | Dr. McNaughton's highly innovative research aims to understand the biological mechanisms underlying higher brain function, bringing brain science to a more complete understanding of normal brain function. The results of Dr. McNaughton's research may help us to develop better treatments for brain-related disorders such as Parkinson's disease, fetal alcohol syndrome, brain trauma, stroke, and substance abuse. | Bruce McNaughton | University of Lethbridge | $1,277,759 | $426,748 |
| 2008/09 | Bioengineering Technologies for the Clinical Application of Stem Cells | The award will be used to develop a reliable, efficient and safe method to scale-up the production of specialized stem cells, which could become important in the treatment of Parkinson's and Huntington's diseases. With this equipment, Dr. Behie's team will also have the ability to characterize other types of stem cells, potentially leading to new treatments for diseases such as diabetes, arthritis, and heart disease. | Leo Behie | University of Calgary | $704,081 | $200,000 |
| 2008/09 | High Power Micro-Computed Tomography (CT) at the University of Calgary | The award will purchase imaging equipment that enhances the capacity at the University of Calgary to do high powered scanning of bone and fossil material. It will become the highest-powered CT scanner at the institution and will be used by the researchers for their program in comparative bone and joint biology. | Jason Anderson Jessica Theodor | University of Calgary | $601,524 | $240,609 |
| 2008/09 | Multi-Touch Displays for Interactive Information Visualization | The award will purchase equipment that will enhance research capacity in software development for multi-touch digital displays. The software for this new type of display, called massively multi-touch (MMT), encourages collaborative, visual and interactive access to data. | Sheelagh Carpendale | University of Calgary | $468,690 | $182,537 |
| 2008/09 | Structural Mass Spectrometry for Developing Therapeutics | The award will support the purchase of a specialized mass spectrometer to develop new imaging technology, advancing our understanding of highly complex protein interactions. With this new capacity, Dr. Schriemer and his team will be able to make important research contributions to the development of antibacterial vaccines and therapies for breast cancer. | David Schriemer | University of Calgary | $1,580,174 | $579,912 |
| 2008/09 | Exploring the Molecular Basis of Transcriptional Control Inside Living Embryos | The award will support the purchase of potentially transformative light microscopy equipment that will allow the researchers to observe single genes being transcribed within a cell or individual proteins interacting with each other. Dr. McGhee will use this demonstration technology to observe and study the transcription of genes in the nematode animal model, which will aid in our understanding of the human digestive tract. | James McGhee Jeffrey Gaudet | University of Calgary | $1,964,914 | $785,966 |

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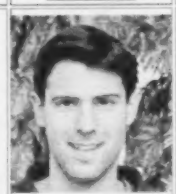
| 2008/09 | A laser scanning facility for rapid three-dimensional measurement | The award will purchase laser scanning equipment of importance to both geomatics engineering and bioengineering. The research program will specifically focus on potential applications to the analysis of the structural integrity of infrastructure such as bridges, the detection and diagnosis of scoliosis, and the application of surveying and mapping services to private industry and government. | Derek Lichti | University of Calgary | $354,117 | $139,523 |
| 2008/09 | Infrastructure to support the environmental risk assessment of novel transgenic crops | The award will purchase equipment for this research program that will assess the environmental risk of new crops. One of these crops is a specialized canola which uses nitrogen much more efficiently than the canola that is currently available on the market. The researchers will thereby contribute to the important testing process, which will ensure the biosafety of these new crops. | Linda Hall<br> Habibur Rahman<br> Randall Weselake | University of Alberta | $650,100 | $259,860 |
| 2008/09 | Microfluidics Platform for Transport Processes in Porous Media related to Energy Sector | This award will purchase equipment to enhance research on the interactions between water, oil, and rock at a micro-scale (microfluidics) that occur in porous material, such as the oilsands reservoirs. Dr. Mitra's research has the potential to create new opportunities for Alberta companies involved in the energy sector by reducing the amount of energy and water needed for oil exploration activities. | Sushanta Mitra | University of Alberta | $289,816 | $89,575 |
| 2008/09 | Infrastructure for Deployment and Maintenance Environmental Wireless Sensor Networks | This award will purchase equipment to further develop and test the deployment of wireless sensor networks on the landscape. The equipment is essential to the team's aim to increase the sensitivity of the technology for detecting remote signals. The fully developed technology could be used for avalanche detection, environmental monitoring, forest fire management, and other related applications. | Sebastian Magierowski<br> Geoffrey Messier<br> Bob Davies | University of Calgary | $343,955 | $127,027 |
| 2008/09 | Functional Inorganic Polymers: New Hydrogen Storage Materials and Precursors to Chemically Resistant and Insulating Nanomaterials | This award will purchase equipment to launch this research program in polymer chemistry and nanoscience. One of the research goals is to develop new methods to safely store hydrogen for use in fuel cells. The new equipment is essential for his team to build novel hydrogen storage devices and will complement the facilities already available in the University of Alberta's Alberta Centre for Surface Engineering and Science. |  Eric Rivard | University of Alberta | $298,040 | $96,400 |

| Funding Year | Project Title | Descriptive Summary | Primary Investigator | Lead Organization | Total Project Cost | RCP Funds Approved |
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| 2008/09 | Advanced Microwave to Millimeter-wave MEMS and CMOS System Development | Drs. Daneshmand and Moez will combine their expertise in radio frequency devices and integrated circuits and systems to develop new microwave devices and test their functionality and limitations. The new devices can be used to improve the speed of data communications and lower the cost of communication products. | Mojgan Daneshmand Kambiz Moez | University of Alberta | $543,950 | $217,580 |
| 2008/09 | A laboratory to study novel aspects of Neurofibromatosis Type 2 regulation | The award will purchase equipment to study genes that have the potential to regulate Neurofibromatosis Type 2 (nervous system tumours). The disorder affects hundreds of patients in Alberta and the current treatment approach, surgery, does not cure the patient of the disease. Dr. Hughes is investigating a new approach to understand why the disease occurs and how to use this understanding to regulate the growth of the tumour. | Sarah Hughes | University of Alberta | $347,248 | $138,899 |
| 2008/09 | Instrumentation for Nano-particle Research | Dr. Olfert will use the award to purchase equipment to understand how particulate matter emissions affect climate, the environment, air quality, and human health. One of the aims of Dr. Olfert's research is to help inform policy decisions regarding particulate matter emissions. Another aspect of his research is to identify particulate matter from its source and try to reduce its release into the atmosphere. | Jason Olfert | University of Alberta | $287,781 | $101,335 |
| 2007/08 | Women and Exercise: Infrastructure for Understanding a Complex, Integrative Physiology | Dr. Billaut's research addresses the question of sex differences in skeletal muscle fatigue. The neuromuscular and metabolic functions will be originally studied, and the role of a revolutionary model of muscle fatigue will be envisaged. His multi-disciplinary investigations will provide crucial information on the female physiology to enhance health and sport performance. | Francois Billaut | University of Lethbridge | $289,032 | $86,710 |
| 2007/08 | Infrastructure for Molecular Evolutionary Ecology Laboratory | New equipment to examine genetic changes in Alberta's bird populations, and using this information to discover how bird populations respond to changes in their environment. Government and industry can use the information to develop policies to support sustainable development and to protect wildlife in Alberta. | Theresa Burg | University of Lethbridge | $197,928 | $59,378 |
| 2007/08 | Research facility for organometallic chemistry, catalyst development and new material synthesis | Dr. Hayes will use the equipment to develop new ways to create materials with the aim of reducing production costs and unwanted byproducts that may impact the production of materials such as pharmaceuticals, electronics and farm chemicals. | Paul Hayes | University of Lethbridge | $297,802 | $89,341 |
| 2007/08 | Molecular Mechanisms of Small Ribonucleoproteins | New research infrastructure addresses the function and structure of small ribonucleoproteins, essential cellular complexes consisting of RNAs and proteins. Dr. Kothe's multi-disciplinary investigations will provide crucial information on the building principles of cellular machines and the molecular causes of diseases. | Ute Kothe | University of Lethbridge | $329,440 | $98,832 |

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| 2007/08 | An Immunobiology Laboratory for Analysis, Purification, and High Throughput Automated Screening of Immune Cells and their Receptors | Dr. James Stafford will use the grant funds to establish a biological laboratory to study aspects of the fish immune system that help to remove virus-infected cells and tumours. His collaborations with biomedical researchers will help to transfer the research results to investigations of human immunotherapy. | James L. Stafford | University of Alberta | $412,877 | $123,863 |
| 2007/08 | The regulation of microtubule dynamics and microtubule-based processes in living cells | Dr. Martin Srayko will buy a state-of-the-art microscope and other supporting equipment to get a detailed view of the internal structure and dynamics that control a cell's shape. The research will contribute to the basic understanding of cell division, an important aspect of cancer research. | Martin Srayko | University of Alberta | $866,303 | $90,000 |
| 2007/08 | Integrative Genomics in Forest Trees: Scaling from Molecular to Eco-physiological Processes | Genomics technologies can be used in forestry to discover genes that regulate important processes such as wood production, how trees prepare for winter, or how they defend themselves against pests like the mountain pine beetle. Diagnostic genetic markers developed using genomics have applications in tree improvement and ecological monitoring. | Janice Cooke | University of Alberta | $355,726 | $106,718 |
| 2007/08 | The role of the tumor suppressor protein, RASSF1A, in cancer and inflammation | Dr. Baksh will use the award to purchase specialized equipment to study the molecular mechanisms of inflammation. Dr. Baksh's research could lead to earlier cancer detection and a better understanding of possible genetic links to Crohn's disease. | Shairaz Baksh | University of Alberta | $368,786 | $103,256 |
| 2007/08 | Non-genetic cell phenotype variability in cell fate commitment and tumor progression | Dr. Huang will purchase equipment to investigate why genetically identical cells within a group of cells behave differently. This research may help to better understand cancer and stem cell behaviour and contribute to the field of regenerative medicine. | Sui Huang | University of Calgary | $785,811 | $235,743 |
| 2007/08 | The Andrology Research Centre for the study of regulation of sperm function and its contributions to early embryo development | The purpose of this proposal is to develop a world-class Andrology Research Centre for studying the regulation of male fertility with the long-term goal of developing an innovative approach for identifying fertile bulls at their earliest possible age and advancing knowledge relevant for understanding male-factor infertility at an interdisciplinary level. | Jacob Thundathil | University of Calgary | $636,400 | $190,920 |
| 2007/08 | Alberta Bone and Joint Health Technology Assessment Decision Support Laboratory | Using health technology assessment in a practical iterative framework to inform evidence-based treatment and policy decisions about those suffering with bone and joint conditions. This research will lead to the development of new evidence-based approaches to improve the quality and efficiency of bone and joint care. | Deborah Marshall | University of Calgary | $293,760 | $88,128 |

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| 2007/08 | CCBN Imaging Centre Upgrade | Dr. Robert Sutherland will purchase specialized equipment to enhance the overall use of the imaging equipment, enabling the CCBN researchers to operate their suite of equipment at a lower cost, improve imaging capabilities, and ensure that this internationally recognized research team remains at the forefront of their field. | Robert J. Sutherland | University of Lethbridge | $523,930 | $157,170 |
| 2007/08 | *In vivo* imaging laboratory | Dr. Catherine Chan will purchase *in vivo* imaging equipment that can be used for multiple fields of medical research, especially diabetes. The specialized equipment enables the researcher to relate results from a living system to earlier results discovered in tissue culture, making the imaging laboratory a powerful tool for Alberta's diabetes researchers. | Catherine B. Chan | University of Alberta | $360,826 | $108,247 |
| 2007/08 | The contribution of reactive glia to central neuropathic pain | New equipment to research chronic pain, particularly the neuropathic pain related to multiple sclerosis and spinal cord injuries, at the molecular and cellular levels. Dr. Kerr's lab will offer valuable training experience to graduate students and postdoctoral fellows for Alberta's biotechnology sector. | Bradley Kerr | University of Alberta | $312,100 | $93,630 |
| 2007/08 | Study of regulatory pathways controlling lipid and cholesterol metabolism in *Drosophila* | Dr. Kirst King-Jones will use the grant to purchase equipment for research in lipid metabolism, which supports human growth, development and health. By using genomic and fluorescent microscopy techniques, he will identify important genes related to metabolic processes, and especially those that are involved in the regulation of fat, sugar and energy. | Kirst King-Jones | University of Alberta | $344,826 | $103,448 |
| 2007/08 | Thermal-sprayed nanostructured Coatings for Equipment in the Natural Resource Sector | Dr. André McDonald will purchase specialized tools to make and test nanostructured titania coatings on gas pipelines and other mechanical equipment in order to prevent rust damage. He aims to bring the technology to commercialization, helping Alberta's oil and gas industry combat corrosion cracking and oil sand slurry wear. | André G. McDonald | University of Alberta | $332,741 | $99,822 |
| 2007/08 | Optical instrumentation for the investigation of industrial flows related to oil sand and energy production | Advanced optical instrumentation, tomographic particle image velocimetry (TomoPIV) will be used to investigate flow problems and phenomena related to the production of oil sand. This measurement system combined with a unique flow facility under development will allow fundamental and applied research and will be a one-of-a-kind in the world. | David S. Nobes | University of Alberta | $283,293 | $84,989 |
| 2007/08 | Scientific Computing Infrastructure for CO2 Injection Enhanced Oil Recovery | Dr. Chen will purchase computing infrastructure to allow him to make highly detailed computer simulations of CO2 sequestration and improve the efficiency of oil recovery from reservoirs. Dr. Chen's research will help in the global effort to find solutions to minimize greenhouse gas emissions. | Zhangxing (John) Chen | University of Calgary | $1,171,878 | $351,563 |

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| 2007/08 | Development of a cell biotechnology suite to evaluate functional feeds and their impact on animal immunity and health | Dr. Barreda will use the award to purchase the tools he needs to test various fractions of Alberta crops, including barley, for their positive impact on livestock health. His research offers the potential for Alberta's agricultural sector to find added value from the crops they produce. | Daniel R. Barreda | University of Alberta | $420,537 | $126,161 |
| 2007/08 | New Imaging Technologies to Study Immune Receptors at the Single Molecule Level | The new research focuses on gaining a better understanding of our immune system's ability to protect us against fungal infections. Dr. Touret's research may lead to strategies that prevent fungal infections, and his techniques and the new equipment offer an excellent research and training opportunity in advanced imaging techniques for his colleagues and students. | Nicolas Touret | University of Alberta | $919,175 | $225,720 |
| 2007/08 | Low Background Counting Facility at the University of Alberta | Dr. Krauss will purchase equipment for research in the area of astroparticle physics. He will build unique and highly sensitive detectors which will improve the search for dark matter, a search that is an international effort. Dr. Krauss's research contributions are of high international significance and build upon Canada's recognized strengths in the field of astroparticle physics. | Carsten Krauss | University of Alberta | $200,000 | $60,000 |
| 2007/08 | Comprehensive multi-dimensional gas chromatography - time-of-flight mass spectrometry facility for advanced research in gas-phase separation science | Dr. Harynuk will purchase specialized equipment that allows him to measure small amounts of compounds in samples that would otherwise be difficult to measure using conventional methods. His research and expertise in analytical chemistry can be applied to many areas, including analysis and new techniques related to tailings mixtures from the oil and gas industry, agricultural products, and health research. | James Harynuk | University of Alberta | $377,065 | $90,000 |
| 2007/08 | The integration of development, genetics, and phylogenetics to understand mechanisms underlying diversity of important fruit and floral traits in plants | Dr. Hall will purchase equipment that allows her to investigate and compare the genetic connections between canola, and a related and well-studied plant, Arabidopsis. In particular, she will study the genetic control of flower and fruit development in plants that share the same family as canola, which may lead to the development of better control strategies for early pod shattering. In using a genetic approach, Dr. Hall will introduce important molecular techniques to the next generation of researchers. | Jocelyn Hall | University of Alberta | $301,836 | $90,551 |
| | | 152 Projects Total | | TOTAL: | $102,597,278 | $37,775,508 |

# RESEARCH CAPACITY IMPACTS REPORT 2012

Alberta

ENTERPRISE AND ADVANCED EDUCATION

Research Capacity Planning
Phipps-McKinnon Building
#500, 10020 - 101 A Avenue
Edmonton, AB
Ph 780 422 4845 Fx 780 427 1430

http://eae.alberta.ca